STRATEGIES FOR EXPLOITING AMERICAN INVENTIVENESS IN THE WORLD MARKETPLACE

HEARINGS

BEFORE THE

SUBCOMMITTEE ON
SCIENCE, RESEARCH AND TECHNOLOGY

OF THE

COMMITTEE ON
SCIENCE AND TECHNOLOGY
HOUSE OF REPRESENTATIVES

NINETY-NINTH CONGRESS

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CONTENTS

WITNESSES

Page

June 24, 1986:

Hon. Vic Fazio, a Representative in Congress from the State of California 7
Dr. Myron Tribus, director, Center for Advanced Engineering Study, Massachusetts Institute of Technology, Cambridge, MA, on behalf of the National Society of Professional Engineers, Alexandria, VA 23
Lee W. Rivers, director, corporate planning, Allied-Signal, Inc., Morristown, NJ; Victor Radcliffe, vice president, National Forge Co., Washington, DC, and William W. Chenault, executive vice president, Fayette Manufacturing Corp., Tracy, CA 59

June 25, 1986:

Dr. W. Dale Compton, senior fellow, National Academy of Engineering, Washington, DC 112
Dr. Joseph M. Juran, chairman, Juran Institute, Inc., Wilton, CT, John J. Hudiburg, chief executive officer, Florida Power & Light Co., Miami, FL; John L. Hansel, chairman of the board, American Society for Quality Control, Washington, DC 127
Donald S. Beilman, president, Microelectronics Center of North Carolina, Research Triangle Park, NC; and Frederick W. Garry, vice president, corporate engineering and manufacturing, General Electric Co., Fairfield, CT 167

June 26, 1986:

Hon. Don Ritter, a Representative in Congress from the State of Pennsylvania 207
John A. Mittino, Deputy Assistant Secretary for Production Support, Department of Defense, accompanied by Kenneth Foster and John F. Eck 238
Prof. George C. Lodge, Harvard Graduate Business School 251
Howard D. Samuel, president, Industrial Union Department, AFL-CIO 274
Dr. Allen B. Rosenstein, professor of engineering, University of California at Los Angeles 283

APPENDIX

Letter from Dr. Myron Tribus dated June 25, 1986 with attachment 323
Report: "U.S. Trade Balance At a Turning Point: Can We Eliminate the Trade Deficit by 1990?" 332
Prepared statement of the Hon. Don Ritter, June 26, 1986 358

STRATEGIES FOR EXPLOITING AMERICAN INVENTIVENESS IN THE WORLD MARKETPLACE

TUESDAY, JUNE 24, 1986

House of Representatives,
Committee on Science and Technology,
Subcommittee on Science, Research and Technology,
Washington, DC.

The subcommittee met, pursuant to call, at 9:45 a.m., in room 2318, Rayburn House Office Building, Hon. George E. Brown, Jr., presiding.

Mr. **Brown**. The subcommittee will come to order.

The chairman of the Subcommittee on Science, Research and Technology, the distinguished Representative from Pennsylvania, has generously invited me to chair this 3-day series of hearings and I would like to call on him at this time for any opening statement that he might have.

Mr. **Walgren**. Thank you very much, Mr. Brown. As those in the audience know, Congressman Brown used to chair this subcommittee and has maintained an interest in this subject area that is probably as intense as anyone else in the Congress. And as the formal chairman, I certainly appreciate his investment of time in this area and in these hearings. I am going to try to spend as much time as I can with him but I am, unfortunately, going to have to be in and out.

I wanted to say at the outset, it doesn't come as news to anyone that we have a problem in getting the fruits of American research and development into the commercial marketplace.

We are confronted with the ironies at every turn—the same country that leads the world in basic research is also in my part of the Nation the home of the rust bowl. The same country that invented the transistor and other things like the television, and the video cassette recorder is running up a multibillion dollar trade deficit in this same area. The country that invented the assembly line and perfected the industrial revolution is really not competing very well worldwide and has to learn to compete again.

I can't help but believe that all the elements of revival are available to us in our society if we can only find the right chemistry and the right formula.

We still have more than our share of inventive geniuses. The Silicon Valleys as well as the Pittsburghs of the country are filled with people who are eager in every way to compete, to create new products, to pursue entrepreneurial advantages. Our venture capital markets are strong and are the envy of the world. We have highly skilled individuals available to work and others who would retrain if the opportunities were there.

I hope that during these hearings that we can add to the developing realization in our country that there is much that we should be doing together to unlock the strength of American inventiveness.

I know in public opinion polls in my State there is a growing realization that government, industry, and the educational community have got to be working together in new ways and in new forms, to try to bring us out of the difficulties we face. And if that is showing up in public opinion polls, it is taking hold with the American people as a whole.

If we, as Government, are the cause of an industry's problem, we should see if there is a way that we can correct that mistake. And if we could serve as a catalyst to enable something to happen in the private sector, we should be willing to reorganize Government and rethink Government's role in order to make that happen.

I know that this is a large societal problem, literally, and it is probably wrong to think that one set of hearings, one proposal alone can turn things around. And yet, the Congress is the best body to provide the forum for discussion and the broadening of consensus and understanding that we have. And certainly we on this committee are open to the suggestions which we will hear in these hearings. We want to promote them, we want to work with you, and to give your best ideas and those of others life in the legislative process and make a contribution to our country doing better economically.

So with that, Mr. Chairman, I certainly appreciate your contribution to these hearings and I look forward to the testimony and working with the product of these hearings to see if there isn't some way we can make a contribution in this area.

Thank you.

Mr. Brown. Thank you very much, Mr. Walgren.

[The prepared opening statements of Mr. Walgren and Mr. Boehlert follow:]

OPENING REMARKS OF THE
HON. DOUG WALGREN, CHAIRMAN
SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY

HEARING ON
STRATEGIES FOR EXPLOITING AMERICAN INVENTIVENESS IN THE WORLD MARKETPLACE

JUNE 24, 1986

AS WE BEGIN THREE DAYS OF HEARING PROBING HOW TO GET THE FRUITS OF AMERICAN RESEARCH AND DEVELOPMENT INTO THE COMMERCIAL MARKETPLACE, I DO NOT THINK IT COMES AS NEWS TO ANYONE THAT WE HAVE A PROBLEM. THE SAME COUNTRY THAT LEADS THE WORLD IN BASIC RESEARCH, IS ALSO THE HOME OF THE RUST BOWL. THE SAME COUNTRY THAT INVENTED THE TRANSISTOR, THE TELEVISION, AND THE VIDEOCASSETTE RECORDER IS RUNNING UP A MULTIBILLION DOLLAR TRADE DEFICIT IN ELECTRONICS. THE SAME COUNTRY THAT INVENTED THE ASSEMBLY LINE AND PERFECTED THE INDUSTRIAL REVOLUTION IS JUST REALIZING THAT IT MUST LEARN TO COMPETE AGAIN.

I CAN'T HELP BUT BELIEVE THAT ALL THE ELEMENTS OF A REVIVAL ARE AVAILABLE TO US IF WE CAN JUST FIND THE FORMULA. WE STILL HAVE MORE THAN OUR SHARE OF INVENTIVE GENIUSES. THE SILICON VALLEYS AS WELL AS THE PITTSBURGHS OF THE COUNTRY ARE FILLED WITH THE YOUNG IN SPIRIT WHO ARE WILLING TO TAKE THE ENTREPRENEURIAL RISKS TO START A NEW PRODUCT OR A NEW COMPANY. OUR VENTURE CAPITAL MARKETS ARE THE ENVY OF MUCH OF THE WORLD. WE HAVE HIGHLY SKILLED INDIVIDUALS AVAILABLE TO WORK AND OTHERS WHO WOULD RETRAIN IF THE OPPORTUNITIES ARE THERE.

I HOPE TO LEARN DURING THESE HEARING BOTH WHAT THE FEDERAL GOVERNMENT IS DOING TO HINDER REVIVAL, AND WHAT IT COULD BE DOING TO HELP THINGS TAKE OFF. IF WE ARE THE CAUSE OF AN INDUSTRY'S PROBLEMS, WE SHOULD SEE IF THERE IS A WAY TO CORRECT OUR MISTAKES. IF WE COULD SERVE AS A CATALYST FOR A MORE EFFECTIVE PRIVATE SECTOR, WE MUST BE WILLING TO REORGANIZE THE GOVERNMENT TO MEET THE CHALLENGE. WHILE I AM SURE WE WILL NOT FIND ALL THE ANSWERS OR TURN THINGS AROUND IN A HURRY, I WANT ALL THE WITNESSES AND THE AUDIENCE TO KNOW THAT THIS COMMITTEE HAS A DEEP DESIRE THAT CROSSES IDEOLOGY AND POLITICAL AFFILIATION TO MAKE AMERICA FIRST IN MANUFACTURING AGAIN. WE ARE OPEN TO YOUR SUGGESTIONS. WE WANT TO WORK WITH YOU TO MAKE YOUR BEST IDEAS AND THOSE OF OTHERS INTO A LEGISLATIVE FRAMEWORK THAT PERMITS AMERICAN INNOVATORS AND ENTREPRENEURS TO SUCCEED.

OPENING STATEMENT
CONGRESSMAN SHERWOOD L. BOEHLERT (NY)
FOR
STRATEGIES FOR EXPLOITING U.S. TECHNOLOGY INNOVATION
JUNE 24, 1986

MR. CHAIRMAN:

I HAVE BEEN LOOKING FORWARD TO THESE HEARINGS BECAUSE THEY WILL FOCUS ON THIS CRUCIAL QUESTION: WHAT CAN BE DONE TO ENSURE THAT THE UNITED STATES BECOMES MORE ECONOMICALLY COMPETITIVE?

WE ALL KNOW THE DISTURBING STATISTICS THAT HAVE PROVOKED THIS QUESTION - GROWING TRADE DEFICITS, POCKETS OF HIGH UNEMPLOYMENT, STAGNATING GNP.

I HOPE OUR WITNESSES WILL PROVIDE SOME INSIGHT INTO WHAT GOVERNMENT AND INDUSTRY SHOULD START DOING OR SHOULD STOP DOING TO REVERSE THESE TRENDS.

I'M PARTICULARLY INTERESTED IN LEARNING WHY WE HAVE SO MUCH TROUBLE TRANSLATING OUR SCIENTIFIC LEADERSHIP INTO TECHNOLOGICAL ADVANTAGE. THE JAPANESE SEEM TO MAKE BETTER USE OF AMERICAN SCIENCE THAN WE DO.

THESE ARE NOT NEW MATTERS FOR OUR SUBCOMMITTEE. CONCERN WITH ECONOMIC COMPETITION IS AN UNDERCURRENT THAT RUNS THROUGH ALL OUR ACTIONS - FUNDING THE NATIONAL SCIENCE FOUNDATION AND THE NATIONAL BUREAU OF STANDARDS, REVISING PATENT AND ANTI-TRUST LAW, INCREASING THE TRANSLATION OF JAPANESE TECHNICAL LITERATURE, FACILITATING THE TRANSFER OF TECHNOLOGY FROM FEDERAL LABS TO THE COMMERCIAL SECTOR.

THESE HEARINGS SHOULD GIVE US A BROAD OVERVIEW TO HELP US EVALUATE THOSE INDIVIDUAL ACTIONS AND TO PREPARE ANY NEW ONES.

THANK YOU.

Mr. BROWN. Our first witness this morning will be our distinguished colleague, the Honorable Vic Fazio from California, who has likewise recognized the importance of this problem and taken his own initiatives to make a contribution toward a solution. And we welcome him here this morning to present any ideas and suggestions that he may have.

STATEMENT OF HON. VIC FAZIO, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF CALIFORNIA

Mr. FAZIO. Thank you very much, Congressman Brown and Congressman Walgren, our joint chairmen today. It is nice to see you back in the chair, George. I am sure your stint in that chair over prior years makes you feel very comfortable there. And I know Doug values the input that you continue to give this committee and the Congress in general.

I have a couple of relatively brief things I wanted to put on the record, and I am very pleased, I might add, that you have asked me to join you early in the process of exploring during this 3-day series of hearings that you are having the question of strategies for exploiting American inventiveness in the world marketplace.

I think most of us realize that we have a number of problems that simply will not go away in this area. We look at our plummeting trade surplus, now a tremendous deficit, the loss of 2 million manufacturing jobs, and roughly half a million farms in foreclosure. I think we all realize that the marketplace that we are used to competing in is a very different one today than it used to be. We have to, obviously, confront unfair trade competition when and wherever it occurs.

I think there is an increasing respect for the trade legislation enacted by the House of Representatives. Certainly the business community is taking it seriously and the administration is reacting as normal—reacting, I think, with a new alacrity.

We clearly can't simply rely on a laissez-faire free trade environment and expect all of the problems that have become endemic in American society to be righted on that basis.

Second, I would like to point out that we need to take a far more comprehensive approach to our trade and competitiveness problems. I have introduced legislation, H.R. 4226, the Competitive American Reform Act. It is a bill similar to legislation authored on the other side by Senator Gary Hart, which advocates a comprehensive solution to our trade problems on a broad array of fronts, offering no single panacea, talking about the need to deal with Third World debt problems, job training, and I might add, assistance for those who lost their jobs due to uncompetitive marketplace, education, strengthening the basic core—math and science programs, basic research, monetary reform—all of these issues which I must admit are easily dealt with in the administration and much more difficulty—much more to difficult to attack in the Congress, but which we must be working together on.

We often look for very quick and easy answers in an area that is very difficult and intractable over a long period of time. We don't make progress unless we take a more comprehensive route, and certainly I think the effort you are making today is part of that broad-based approach that has been lacking from the perspective of the Executive, certainly, and I am afraid also from that of Congress.

One proposal which I know you will fully explore during this 3-day series is the legislation which Congressman Brown has introduced, H.R. 3997, the National Policy and Foundation Act, which I am privileged to be a cosponsor of.

It really is a recognition of one of the most important causes of our current trade in the competitiveness problem. The United States has simply no effective instrumentality to create a cohesive economic policy in this area. We have no institutions which can effectively galvanize public and political opinion for our competitiveness agenda.

I certainly want to wholeheartedly commend you, Mr. Brown, and support the measure. I am sure the committee will give it serious and thorough review.

And, of course, we can't neglect the area of tax reform and changes in our basic policy toward competitiveness. We have numerous incentives for nonproductive investments in the code, numerous incentives for investments which work, frankly, at cross purposes with other Federal policies.

I think the tax bill as we see it emerging is going to make some improvements in this area, certainly not resolve all our problems. But I think they are being addressed.

Our friend from California, Leon Panetta, recently pointed out that we have tax policies that encourage investors to begin raising unneeded irrigated crops on easily erodible soil in Nebraska using scarce water at the same time that the Government is fighting soil erosion and looking for ways to conserve that water. And that kind of anomaly is not alone in Federal policy. It crops up periodically in every section of the code and in conflict with our Tax Code.

So we have to address the Tax Code to get more savings and investment we all have come to believe that it is almost jargon in this institution today. And we are making, as I indicated, some progress. I am hopeful the conference committee on the tax bill will make even more.

But I would like to focus on two other concerns that I think are more central to the hearings that you are about to embark on.

First, one of the provisions of the bill that I cosponsored with Senator Hart calls on the National Science Foundation to study the need for the creation of a National Corporation for Cooperative Laboratory Research. As introduced, this National Corporation—would have central control over all Federal labs for the primary purpose of consolidating facilities, resources, and research activities, and promoting greater use of the Federal laboratories by academic institutions, and the private sector.

Since its introduction, I have received a number of comments on the scope of the proposal. I have come to the conclusion that it is not just desirable but essential that there be improved interaction and cooperation between the Federal labs and industry and universities, I think it would be more appropriate that we explore ways to improve and better coordinate the current relationship between these entities rather than setting up a new administrative structure.

The Department of Energy laboratories, of which I am most familiar as a member of the House Appropriations Subcommittee on Energy and Water Development, have inventoried their facilities and have published a registry which describes each laboratory's location and capabilities, and provides a contact for interested parties.

Some of the laboratories which are particularly interesting to industry have been designated as "user facilities," which means that they are made available to industry without cost, of the research which will be published, or at a nominal fee, if the investigator is to retain proprietary rights. There is presently intense industrial use of many of these facilities.

I think the last thing we need is a federally coordinated research program in which the Government chooses the line of inquiry. I think the involvement of the Federal Government is essential but the line of inquiry has to be worked out in a cooperative and sharing venture.

The genuine cooperation between industry and Government in research in which all participants can gain is a major strength that we have to exploit. This could be our answer to the nationally coordinated programs of Japan and the European Economic Community.

The National Science Foundation is utilizing this approach more, and we need to extend it to all of our Federal labs and other agencies involved in research.

The second issue which I would like to raise is retaining our historical commitment to the peer review process for awarding research grants. Little we might do to impart coherence to our Nation's long-range research planning will be relevant if the Congress fails to come to grips with its own tendencies to earmark specific scientific projects in the budget. Such earmarking simply bypass any structures we might set up to insure that merit, not political influence, becomes the basis for facilities in research funding.

This is relatively new phenomena and it has burgeoned into a genuine threat to our science program in only the last few years. Figures cited recently on the Senate floor indicate that in 1982 the Congress earmarked $3 million for scientific research projects, specific projects at specific universities.

The Senate debate, however, indicates that by 1985, that figure had grown to $137.6 million. The debate itself was over an amendment to the urgent supplemental appropriations bill which sought to earmark some $80 million more in Defense Department research funding to a preselected group of postsecondary institutions.

It is worth noting that this single package affected funds in only one agency and yet exceeded the remaining $75 million in unearmarked research funding in the same bill.

If Congress is to discipline itself and is to curb its seemingly irresistable temptation to bring home the bacon, it will need to take the underlying causes for this systemic breakdown into account.

Some universities feel that the peer review process is too much of a closed club; those who make the awards are those who receive them. This may be and it's probably partly a self-serving criticism. However, to the extent it is valid, the peer review process must be, and must be perceived to be, fair.

To achieve fairness it will probably be essential that this committee bring more order to the peer review process itself. There should be an underlying unity and consistency in Federal research policy.

At the moment, there are many ways in which agencies seek to ensure merit in their grant awards. I believe a common Federal approach to assessing merit would inspire more confidence among applicants that procedure and not favoritism is dominating the selection process.

If the approach across agencies and for various types of research should not be the same, I believe more could be done to make a variety of mechanisms formalized, each appropriate for a subset of situations but each predictable and providing some assurances that the results are not the product of manipulation.

If we had clearer and more comprehensive systems to rely on, the excuse for coming to Congress would be diminished, and Congress' ability to rebuff supplicants would increase.

Second, the competition for research and facility funding via congressional earmarking comes at a time when Federal education assistance and economic development assistance are on the wane. This may be a coincidence, but I think not. The losses in these other areas are creating hungers which people hope the science budget can satisfy.

One frequently hears reference to the developmental needs of universities, to their resentment of the elite who control the peer review process. And these projects are frequently justified on the basis of the jobs they create and the ancillary benefits they engender the private sector investments that are forthcoming.

Both university development and economic renovation are important social goals. However, I think we would all be well-advised to consider that they may differ starkly with the goals of the Federal research programs.

We need to improve cooperation between industry and academia, but if we try to develop universities and build academic facilities solely for economic development reasons, we may strengthen our science program only by accident. More likely, we would be dispersing our scientific resources without much truly long-term benefit to the Nation as a whole. We can't simply transplant facilities into institutions which are unable to usefully apply them. The facilities will wither, and even the recipient school will be—little better off, and the taxpayer will have suffered.

The solution is to recognize the potential conflict in objectives, first, and then to decide how we rank these priorities. Perhaps we can decide, as I believe we should, that we would be much more inclined to spend, at least on university development separately from the national research program, with the objective of building a wider base of institutions which will eventually be able to compete head-to-head with the so-called elite and still win. That means putting more money into university development directly quite apart from scientific research in and of itself.

So let me finally once again commend the subcommittee for holding these very important hearings and also for your indulgence in particularly my introductory remarks which are pretty general in nature.

[The prepared statement of Mr. Fazio follows:]

STATEMENT OF THE HONORABLE VIC FAZIO BEFORE THE HOUSE SCIENCE AND TECHNOLOGY SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY

June 24, 1986

Mr. Chairman, Members of the Subcommittee:

It's a pleasure and a privilege to join you today as you launch this three-day series of hearings on "Strategies for Exploiting American Inventiveness in the World Marketplace."

This is a critical area of public policy that demands a great deal more exploration and development by knowledgeable men and women such as yourselves. And I would like to commend you for working to ensure that these issues stay in the forefront of the congressional agenda as we seek to grapple with the competitiveness and trade crisis facing our Nation today.

I would just like to raise a few points before you move on to talk to the real experts in this area. I've seen your witness list and I know that these hearings will help to construct a solid foundation for future actions by a more enlightened Congress.

There are no easy solutions to the U.S. trade and competitiveness crisis. But there are three basic elements which must be a part of any effort to create a cohesive trade policy and put in place an agenda for economic competitiveness.

First, it is not enough to rely on free markets to ensure the competitiveness of American goods and services. The administration's blind faith in free trade and its unwillingness to confront the need for institutional change has meant a sustained pattern of foreign capture of both our domestic and foreign markets. Since 1981, the U.S. trade deficit has nearly quadrupled, and the current account balance has plummeted from +$6 billion to -$110 billion. Over 1.7 million manufacturing jobs have been lost, and roughly half a million farms have been forced to foreclosure.

And this is not a problem that has only recently begun to surface. The U.S. has been losing market share in manufacturing jobs for more than 20 years, since 1965.

Real wages have been steadily declining for more than ten years, since 1973.

We can't rely on free markets alone because free markets don't always mean fair markets. The U.S. must be willing and able to confront unfair trade competition when it occurs.

We can't address our trade deficit by closing the world out. But we do need a more active defense of America's trading rights. We need a new round of trade negotiations so that we can expand international trading rules to cover farm products, high-technology and services -- key American industries that now are at the mercy of foreign governments who subsidize their exports and foreign industries who dump their products on our shores.

Moreover, we need to recognize that our economic security is as urgent a priority as our national security. Far too often, the administration has waited to take action on trade disputes until the political "heat" became unbearable. That strategy may have protected the administration's political security, but it has done nothing to protect the economic security of our farmers, microchip producers and steelworkers. We need trade sanctions that take effect -- not when the president's polls begin to drop -- but as soon as our trading rights are violated. That's the kind of approach that must be an essential part of any effective trade policy.

The second part of my homespun prescription is that we must take a comprehensive approach to our trade and competitiveness problems. As the author H.R. 4226, the Competitive America Trade Reform Act, which I introduced earlier this year with Senator Gary Hart, I have advocated a comprehensive solution to the trade crisis. We need a concerted and coordinated trade policy that calls for action on a broad array of fronts. No single action alone can reverse the trend of expanding trade deficits, and reinstill American competitiveness. We need action on Third World Debt problems, job training, education, basic research and monetary reform.

Too often, as Americans and legislators, we look for the quick and easy answer to difficult problems, and too often they disappoint us. As you explore various exploiting American inventiveness over these next few days, I urge you to carefully consider those proposals which offer a radical restructuring of our institutions. From those ideas, from those new approaches, viable long-term solutions can be found.

One proposal which I know you plan to fully explore has been introduced by my good friend and a Member of this Subcommittee, Congressman George Brown. H.R. 3995, the National Policy and Technology Foundation Act, which Mr. Brown has authored and which I am privileged to cosponsor, is a reflection of Mr. Brown's view that new demands often require a new approach to social organization.

The Policy and Technology Foundation has been designed as an effective, efficient, nonpartisan, national policy mechanism. With its nine main branches and appropriate independent public councils, the Foundation would be in a position to analyze the micro and macro policies of federal agencies and provide the Executive Branch and the Congress with the analysis necessary to create an integrated, coherent and consistent national policy that will meet our Nation's long-term public interest, including our interest to ensure the competitiveness of U.S. products and services in world markets.

The Policy and Foundation Technology Act is in recognition of one of the most important causes of our current trade and competitiveness problem: the U.S. has no effective instrumentality to create a cohesive economic policy. We have no institutions which can effectively galvanize public and political opinion for an effective competitiveness agenda. I wholeheartedly commend support this measure, and I commend it for your review.

And, the **third major element of any effort to improve U.S. competitiveness should be tax reform.** We need a sound tax policy that promotes rather than discourages productive investment. Under the current tax system, there are numerous incentives for non-productive investments, and numerous incentives for investments which work at cross-purposes with other federal policies. In agriculture as in other areas, counterproductive and conflicting Federal laws and policies abound. For example, as my colleague from California, Leon Panetta, recently pointed out, there are "tax policies that encourage investors to begin raising unneeded, irrigated crops on easily erodible soil in Nebraska using scarce water at the same time the Government is fighting soil erosion and looking for ways to conserve that water."

By reforming the tax code, by addressing our competitive deficiencies in a comprehensive fashion and by rejecting tha notion that free trade can solve all of our economic problems, we can greatly enhance U.S. competitiveness and overtime reduce the structural trade deficit.

There are just two other concerns I would like to raise to the Subcommittee.

First, one of the provisions of H.R. 4226, which I introduced with Senator Hart, calls on the National Science Foundation to study the need for the creation of a National Corporation for Cooperative Laboratory Research. As introduced, this National Corporation would centralize control over all federal labs for the primary purpose of consolidating facilities, resources and research activities and promoting greater use of the federal laboratories by academic institutions, and the private sector.

Since its introduction, I have received a number of comments on the scope of this proposal. I have come to the conclusion that while it is not just desirable but essential that there be improved interaction and cooperation between the federal labs and industry and universities, I think it would be more appropriate that we explore ways to improve and better coordinate the current relationship between these entities rather than setting up a new administrative structure.

The Department of Energy laboratories, of which as a member of the House Appropriations Subcommittee on Energy and Water I am most familiar, have inventoried their facilities and have published a registry which describes each laboratory's location and capabilities, and provides a contact for interested parties. Some of the laboratories which are particularly interesting to industry have been designated as "user facilities," which means that they are made available to industry without cost, of the research which will be published, or at a nominal fee, if the investigator is to retain proprietary rights. There is presently intense industrial use of many of these facilities.

This is the kind of activity which I think should be encouraged.

The second issue which I would like to raise is the importance of retaining our historical commitment to the peer review process for awarding research grants. Little we might do to impart coherence to our nation's long-range research planning will be relevant if the Congress fails to come to grips with its own tendencies to earmark specific scientific projects in the budget. Such earmarkings simply bypass any structures we might set up to ensure that merit, not political influence, becomes the basis for facilities and research funding.

This relatively new phenomenom has burgeoned into a genuine threat to our science program in only a few years. Figures cited recently on the Senate Floor indicate that in 1982 the Congress earmarked $3 million for specific research projects at specific universities. By 1985, however, that figure had grown to $137.6 million. The Senate debate itself was over an amendment to the urgent supplemental appropriations bill which sought to earmark $80 million more in Defense Department research funding to a preselected group of post-secondary institutions. It is worth noting that this single package affected funds in only one agency and yet exceeded the remaining $75 million in unearmarked research funding in the same bill.

If Congress is to discipline itself and is to curb its seemingly irresistable temptation to "bring home the bacon," it will need to take the underlying causes for this systemic breakdown into account. Some universities feel that the peer review process is too much of a closed club; those who make the awards are those who receive them. This may be and probably is partly a self-serving criticism. However, to the extent it is valid, the peer review process must be, and must be perceived as, fair.

To achieve fairness it will probably be essential that this Committee bring more order to the peer review process itself. There should be an underlying unity and consistency in federal research policy. At the moment, there are many ways in which agencies seek to ensure "merit" in their grant awards. I believe a common federal approach to assessing merit would inspire more confidence among applicants that procedure and not favoritism is dominating the selection process. If the approach across agencies and for various types of research should not be the same, I believe more could be done to make a variety of mechanisms formalized, each appropriate for a subset of situations but each predictable and providing some assurances that the results are not the product of manipulation. If we had clearer and more comprehensive systems to rely on, the excuse for coming to Congress would be diminished, and Congress' ability to rebuff supplicants would increase.

Secondly, the competition for research and facility funding via congressional earmarking comes at a time when federal education assistance and economic development assistance are on the wane. This may be a coincidence, but I think not. The losses in these other areas are creating hungers which people hope the science budget can satisfy. One frequently hears reference to the developmental needs of universities, to their resentment of the "elite" who "control" the peer review process. And these projects are as frequently justified on the basis of the jobs they create and the ancillary benefits they engender.

Both university development and economic renovation are important social goals. However, I think we would all be well-advised to consider that they may differ starkly with the goals of the federal research programs. We need to improve cooperation between industry and academia, but if we try to develop universities and build academic facilities solely for economic development reasons, we may strengthen our science program only by accident. More likely we would be dispersing our scientific resources without much truly long-term benefit to the nation as a whole. We cannot simply transplant facilities into institutions which are unable to usefully apply them. The facilities will wither, and even the recipient school will be little better off.

The solution is to recognize the potential conflict in objectives, first, and then to decide how we rank these priorities. Perhaps we can decide (as I believe) that we should be spending more at least on university development separately from the national research program, with the objectives of building a wider base of institutions which will eventually be able to compete head-to-head with the "elite" and win.

Again, I commend the Subcommittee for holding these important hearings, and I appreciate the Members' indulgence.

Mr. **Brown**. Thank you very much, Mr. Fazio.

I would like to comment that your introductory remarks, despite your qualifications, show a very sophisticated understanding of many of the very important problems that face the country which we have attempted to grapple with in this committee over a number of years.

We very much appreciate this kind of understanding and your willingness to contribute to a solution to the problem as you have evidenced in many ways.

I would like to also welcome our distinguished colleague, Mr. Ritter, who is probably among the Members of Congress the best qualified technically to speak in this area. And his expertise will be recognized not only as a member of this subcommittee but as a witness before it later on during these hearings.

Do you have an opening statement, Mr. Ritter, that you would like to make?

Mr. **Ritter**. No, Mr. Chairman; but I do thank you for that fine introduction. And I recall that introductions, like perfumes, should be smelled but not swallowed. Thank you.

Mr. **Brown**. Mr. Walgren, do you have any questions of Mr. Fazio?

Mr. **Walgren**. Well, not wanting to yield to the expertise of anybody myself, I really want to say how we do appreciate the interest that others have brought to this, and particularly Mr. Fazio—has been one of the most interested members.

The whole question of peer review and the distribution is something that we really are trying to grapple with and it has been raised very dramatically in the press. I appreciate particularly your thought that if we had a system which we might have greater confidence in perhaps we would be more willing to use that system more absolutely.

I can't help but think that one of our problems is that so much of our science spending has not been done through the peer review system. And we rely so heavily on the military to solve instinctively almost all the problems that we want to grapple with. The increase in the military budget this year in research and development is greater than the whole NIH budget in its entirety. And the military is certainly not using the peer review system in deciding where it makes those facility investments in particular.

And so I guess I wanted to say that when you look at the NSF budget you do see a pretty good distribution because they have been very loyal to the peer review system. But when you look at the overall you see some concentrations that go against the grain of, I think, an important value, and that is the distributive presence of science strength in our society.

And so I would look forward to talking with you about that and hopefully we can work our way forward through that problem and make things better than they are now.

Mr. **Fazio**. If I might comment, I have a bit of conflict of interest here because I sit on the Appropriations Committee where we really love to do earmarking. And yet I think so often, coming from a State, as your chairman does today, that competes rather effectively in a number of areas. We might be better off, from my more parochial perspective, to simply let the process—if there is one—work its course.

So I sit somewhat objectively in between these two positions. If they are polarized at this point I think the best example of that is the bill that will be on the floor later this week, if not today.

The Defense Department really does not have, as you say, a peer review process, and that is offered as a justification for taking the approach that has been taken in the Senate and joined in by some Members here in the House. The NSF's Program has its critics but at least it has a process. But then, as you point out, the areas where we have peer review better defined and more generally accepted are increasingly the areas where we are spending less money. And in the Defense Department, where, through SDI and other research, that has potential spinoffs into the private sector, we are still using a different kind of approach.

We don't necessarily want to use the science budget in any agency as a pork barrel. And yet there is the need to, particularly as we don't spend money, to develop the strength of educational institutions the way we did throughout most of our history using the land-grant institutions and others. Since that funding is inadequate today, people go wherever they think they can get a handle on it in order to build their institutional capability, their faculties, their structures. And I think that we have increasingly found that competition somewhat detrimental and certainly increasingly preoccupying those of us in Congress.

Mr. WALGREN. Thank you, Mr. Chairman.

Mr. BROWN. Mr. Ritter.

Mr. RITTER. Mr. Chairman, now that I know where I am and what the subject is, I think that maybe I could—share a few ideas with my colleague from California, and I appreciate his interest in this area.

A couple of things. One, Winston Churchill once said that democracy was the worst form of government except for all others. And perhaps peer review is the worst form of distribution of funds except for all others. But that also leads to a very interesting situation which we find in our universities today, and that is a vast percentage of time of the best faculty, the brightest faculty, is being spent seeking grants.

And I am of the opinion that between 25 and 30—between one-quarter and one-third of our best faculty time is being spent in the grantsmanship process. And this is something that has accelerated over the years as the accountability, and as the Congress, and the agencies, and the OMB, has demanded more and more formality to the process; which kind of gets me back to the earlier years of the Office of Naval Research when technology transfer in computing, and in aerospace industries was legendary. And you can—you don't have to believe me because I am just passing things on—but if you talked to somebody like Bobby Inman, head of MCC these days, when he talks about the early days of DOD funded research at the universities, there was a tremendous energy for technology transfer back then because things were flexible. And people—there was an entrepreneurial spirit. You didn't have to go through 40, 50 layers of bureaucracy before you justified what it was that was going to be done and then justify the last iota of time spent on project XYZ and ABC. And perhaps that's—and then we had the Mansfield amendment which interrupted that whole thing that denied the universities the ability to do research and Defense Department.

We are just getting back to some of that flexibility. So we should be carefuly about denying that. And peer review, by the way, NSF works peer review real well. But peer review may be much more suited to basic science where scientists are reviewing other people. Science, as opposed to the process of technology evolution, technology transfer, which works in and out of the private sector, the markets, the users, and it is very hard. You are trying to simulate market forces or project market forces, and scientists are not necessarily the proper gurus for that process anyway.

Mr. **Fazio**. Could I comment on your point——

Mr. **Ritter**. Yes.

Mr. **Fazio** [continuing]. Because I think that part of what has changed that environment is a tighter budgetary environment, despite the DOD's expansion, other areas of science have seen level funding at best.

But I think it has also been a political target increasingly—everything from Golden Fleece Awards to people whose research doesn't, on the surface, seem to have borne any fruit, to the kind of political attack on pure research that I have been exposed to.

I don't know about the campaigns that you have been in, but my opponents have often used a litmus test of academic failures to talk about all the waste, and fraud, and abuse in Government. It is kind of an anti-intellectual approach, but it works because people wonder why somebody would ever embark on such a ridiculous study as——

Mr. **Ritter**. If the gentleman would yield——

Mr. **Fazio** [continuing]. To determine why red mold is important. And, of course, we all know that it led to penicillin and all that sort of thing. It is so easy to criticize. And I don't know whether I could say both parties have been vulnerable to this easy attack but it has certainly been prevalent in campaigns that I am aware of.

So we in Congress become much more sensitive to the potential for failure—everything has to work and succeed. And that's not how academic or scientific inquiries——

Mr. **Ritter**. Research proposals——

Mr. **Fazio** [continuing]. Should proceed.

Mr. **Ritter** [continuing]. If the gentleman will yield. Today, you almost have to map out exactly what's going to happen 2 and 3 years down the line. Everybody knows it's not true but that's what going into these proposals.

Mr. **Fazio**. Yes.

Mr. **Ritter**. And we're really bureaucratizied——

Mr. **Fazio**. Exactly. Everyone is protecting their behind.

Mr. **Ritter** [continuing]. To a degree where we never were in the days of early technology transfer from DOD or NSF out into the community.

Mr. **Fazio**. So in our bureaucratizing we have lost that flexibility and innovation. And I submit that we in the political process have contributed to that.

Mr. RITTER. How do we regain it? That's the object of the chairman's hearing.

I thank the gentleman.

Mr. BROWN. Much as I'd like to prolong this very interesting philosphical discussion, which does get us off to a good start in exploring many of these ideas, I think we should move ahead. Thank you very much, Mr. Fazio.

Mr. FAZIO. Thank you, Mr. Chairman. Good luck to you.

Mr. BROWN. Our next witness this morning will be Dr. Myron Tribus from the MIT Center for Advanced Engineering Studies at Cambridge.

Dr. Tribus has been a frequent and valuable contributor to the deliberations of the Congress on this subject and many others, and we very much appreciate his being here this morning to help us get started on this renewed attack on this vitally important problem.

Mr. RITTER. Mr. Chairman, if the gentleman will yield, I might say he is also representing the National Society of Professional Engineers [NSPE] in this testimony.

Mr. BROWN. Well, I am sure that he will do a good job of representing them as well as the institution from which he comes.

Dr. Tribus.

STATEMENT OF DR. MYRON TRIBUS, DIRECTOR, CENTER FOR ADVANCED ENGINEERING STUDY, MASSACHUSETTS, INSTITUTE OF TECHNOLOGY, CAMBRIDGE, MA, ON BEHALF OF THE NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS, ALEXANDRIA, VA

Dr. TRIBUS. Thank you, Mr. Chairman. In view of the press of time, I have deposited with the committee my full testimony and attachments and I will only hit the high spots.

Mr. BROWN. The full text will be in the record, Dr. Tribus.

Dr. TRIBUS. Thank you.

To begin, I must say that what I am about to present does not represent the official views of MIT. I am speaking, however, for the National Society of Professional Engineers.

Mr. BROWN. Does MIT have a view on this subject?

Dr. TRIBUS. It has many, sir. You can call for whichever ones you wish. [Laughter.]

My own views have been developing for over two decades in which I have seen the competitive position of my country deteriorate each year. I believe we have reached the proportions of a full-blown crisis and I am pleased that this committee is focusing attention on the problem.

Many well-intentioned people say that the problem is the loss of the work ethic, the overvalued yen, hidden subsidies by Japanese and other governments. We know, of course, there are problems caused by high interest rates and taxes.

But there is another factor which has not had proper recognition and I am going to speak about it almost exclusively in this hearing. My doing so does not mean that I think the other things are not important, but I do believe that this topic is priority No. 1: The way our managerial corps looks at how they are supposed to run our enterprise.

I travel the country now, coast to coast. I visit with top executives in many industries. I talk to people lower down. And I am very confident when I say that in general our manager corps does not understand how to operate in this new era of fierce economic competition. They do not understand how to implement this most important philosophy: constant improvement.

Competitive advantage comes only to those enterprises in which everyone, from the top to the bottom, is engaged in improving the processes in which they work or for which they are responsible.

Modern enterprises are now so complex and under such severe competitive pressure, that unless everyone in the enterprise is working cooperatively on improvement, the enterprise will be left behind.

I do not know of any school of business which teaches its students how to lead employees in finding ways to improve the business.

Now, what does this failure to adopt a philosophy of constant improvement mean? I have some data. I would like to show the first slide. [Slide.]

Here we see the ratio of labor hours to produce a unit of output—the United States versus Japan the ratio depending on the number of manufacturing steps. And as you see from the diagram, all of the points go up and to the right. As the operation becomes more and more complicated, it takes more and more managerial skill to make it work right. And we see American management falling behind in the areas that require the most managerial skill. May I have the next slide? [Slide.]

Many people think that this is a cultural matter. I have here just a portion of the data that we have gathered, or that we have taken from the literature. This chart shows data for four TV manufacturers operating in the United Kingdom. They have the same labor force—two plants are run by Japanese, one by Americans, and one by the British. The British plant is the most highly automated.

If you look at the quality index you will find that 85 percent of the circuit boards produced in the British-run factory had to be reworked versus 5 percent for one of the Japanese plants, 10 percent for the other Japanese plant, and 13 percent for the Americans.

If you look at labor productivity you will find that the Japanese got 83 and 107 television sets per labor-day compared to 71 for the Americans and 56 for the British. Labor turnover was about the same in all of them.

I have more data but the point I want to make is that this was the same labor force, just a different way to manage.

In table 2, I show data that had been gathered by Jim Harbour Associates of Detroit. I have checked these data with people in manufacturing plants in American automobile companies, and they confirm that they are still applicable although they were gathered some years ago.

What was done was to calculate how much extra it costs American manufacturers to make an automobile, divided into categories. For example, the fact that we take twice as many labor hours to do the job means we add $550 to the cost of the car.

The fact that we inspect and rework so many parts adds $329.

The fact that we have excess inventory adds $550.

The fact that we have many more job classifications and, therefore, when a job is to be done there is more coordination, adds $478.

None of these extra costs are culturally induced, although the last one has to be with the long history of bad labor management relations in our country.

I am going to skip a few things but I want to use the last diagram that I have because I think it makes the case very, very well.

When I visited Yokagawa Hewlett-Packard, who are the Japanese affiliates—they are not subsidiaries—of Hewlett-Packard, I met Mr. Ken Sasaoka who is the general manager. He gave me these data. In 1975, Hewlett-Packard made an evaluation of the different divisions of Hewlett-Packard, and as you see from the diagram, in field failure rate, Yokagawa Hewlett-Packard was the worst, and in profitability they were the worst. This internally announced comparison upset Mr. Sasaoka, and he determined they would try to win the Deming Prize as a means of improving themselves.

By 1980, they had achieved the record that is in figure 8. They had the lowest failure rate and the highest profitability of all the divisions.

Now I want to point out, these are the same people.

I had a long talk with Mr. Sasaoka about this—he was very generous of his time. The point I will make to you is that prior to 1975, he was managing just as we manage our enterprises. And then he learned better, and he made the difference. It is not a cultural phenomenon. It is a matter of knowing how to manage.

Now, I trust I've made the point. The first priority in regaining American competitiveness is to change the way our managers go about their jobs. If we don't take care of this first priority item, nothing else we do will be effective.

This is not all we must do. There are many other considerations and I intend to come to some of them in a moment. This committee has considered some of them. But compared to the others, this must be first priority.

Now, some people think we're talking about a cultural phenomenon called Japanese management, and that's simply not true. The origins of so-called Japanese management are strictly American. It all started in 1948 during the MacArthur occupation. Charles Protzman, a senior manufacturing executive from Western Electric, and Homer Sarasohn, a development engineer, were both on the staff of General MacArthur. The MacArthur government was in a terrible position because the American Army was feeding the Japanese people. They decided they should buy Japanese goods in order to help revive the Japanese economy. But when they tried to buy communication equipment, it was of such poor quality they couldn't use it. Therefore, MacArthur asked Protzman and Sarasohn to see what was the trouble.

They reported that the way the Japanese managed their factories simply was guaranteed to put out poor material. So the Americans set up a course in management. If you will look in the September 1985 issue of Quality Progress, published by the American Society for Quality Control, you will not only see the outline of what was taught, but you will see a photograph of some of the people who took the courses. They include Mr. Morita, the honorary chairman of Sony; Mr. Matsushita, who's the present chairman of Matsushita, and many other prominent executives in Japan today.

The American Army of Occupation was determined to get rid of the top ranks of Japanese management, and so they banished them. The Japanese therefore found it necessary to dip into their employee pool and promote people who in the previous era would not ever have come to the top.

In 1950, Dr. Deming went to Japan and introduced statistical quality control methodology. Dr. Juran, whom you are going to hear from shortly, also went over there. I have seen their photographs on the wall of the Japanese Union of Scientists & Engineers. They are highly honored and respected men in Japan, revered as the experts who taught the Japanese about quality.

The U.S. Army introduced work simplification methods. Larry Miles was invited by the Japanese to teach value analysis. The Japanese managers understood that these were important tools. They caught on quickly to the values of what we were teaching them.

In the United States, as soon as the war was over, our managers began to abandon these ideas. They were American developments. We abandoned them. The Japanese took them, they cherished them, they polished them, they gave them a few Japanese twists.

With mastery of process improvement, not just mastery of process, they are now in a strong position to invent and innovate much more rapidly than we, and they are doing so.

Our management is wedded to the idea of a steady state, not continuous improvement as a way of life. American managers ask me to show them how to make a system better; Japanese managers want to become better at the improvement process itself.

What caused the abandonment of the track that we originated?

I must put most of the blame on our schools of business. They have sought to develop an elite corps of professional managers, credentialized by Harvard, Wharton, and the Sloan School at MIT. Their basic concept is if you can manage, you can manage anything. If you ask them, they will say they are teaching the top managers of the future. Their objective is to have as alumni the heads of the Fortune 500.

Now, I suppose these are noble aims, but unfortunately they teach their students to regard the enterprise primarily as an investment portfolio to be managed mostly from financial figures. Financial figures are lagging indicators. Trying to run a company by looking at financial figures is like trying to drive your car guided by the white line in the rear view mirror.

In Japan before the war, the executives were people who had their primary experience at what is called the Zaibatsu, that is, the corporate headquarters of their companies, and they came from the elite. Today the Japanese do not follow that custom. We, in America, are inventing and developing our own Zaibatsu. We call them MBA's.

People ask me to explain in a very few words what's really different about the long forgotten theory of management in the United States I can't do it very easily. The problem is not to teach, but to unteach. For what we have to help people understand is they must abandon an old conceptual framework and accept a new one. I suppose it must have been a similar challenge 500 years ago when Columbus tried to explain the Earth is not flat. Changing a conceptual framework is very difficult for people.

The best I can give you today is a few catch phrases that will give you a glimpse into what is different.

First of all, we have to give up the idea that management is a privilege and labor is a commodity. We have to recognize that people work "in" a system. The manager's job is to work "on" the system to improve it continuously, with their help. The phrase "with their help" carries it with a whole series of training responsibilities that go beyond what is done in most American factories.

We have to teach people that quality is never your problem—it is the way you solve problems. Very few managers undertand that when you concentrate on improving the quality of everything you do, then your problems go away. The Japanese have been taught this for 30 years. We are just beginning.

We have to learn that for a given set of features, the producer of highest quality will be the producer of lowest cost. It is no mistake that the Honda is at once the highest quality and lowest cost vehicle in its class.

Probably the most important principle we have to teach is to drive out fear. It is one of Dr. Deming's mainstays. There is of course one fear that management cannot eliminate. It is the fear the company will fail and all the employees will lose their jobs. That is not the kind of fear that Deming refers to.

The fear that Deming abhors is the fear to tell the truth.

The Commission that's investigating the *Challenger* disaster has not recognized the most important shortcoming of NASA management. If you want to understand what went wrong, you have to ask this question: How is it that NASA management allowed a system to develop in which it ws dangerous for engineers to tell the truth?

I, myself, as an engineer, have worked in organizations where that sort of fear existed. So I understand the situation. We already have the infamous case of the BART engineers who had to fight to tell the truth.

It is not a new phenomena. I recommend to all of you the book by Neville Shute, the author of "On the Beach," who in 1957 wrote the book "Slide Rule," which tells about the disaster that occurred when the British tried to build a dirigible to compete with the Germans who were stealing their passengers on the trans-Atlantic crossing. The experimental R-101 blew up and killed half the design team. It was a disaster just like the *Challenger*. The reasons were the same. When you move a technical program through a political process, it can often become dangerous. It can be corrupted.

Japanese factories are not all well run. Some go bankrupt. Some of their companies also induce fear in their employees. We must keep in mind that we are looking for instances of good management, we are not promoting Japanese management—it is American management that has been abandoned.

Well, I am not going to spend more time on other descriptions of what is different in this way to manage because we are short on time. I can report that the news is not all bad. Some parts of American management are beginning to catch on. You will hear in a day or so, for example, from representatives of Florida Power and Light where the management has accepted the need to change. And you will hear from other people who will tell you more about this different way to manage.

George Washington University has been presenting seminars featuring Dr. Deming. And by conservative estimate, they have reached well over 20,000 people in the last few years. At our Center we have made video tapes of Dr. Deming and others and we think we have reached about 30,000 people in the last few years.

Dr. Juran operates the Juran Institute and holds a conference at which people in hundreds of companies report on the progress that they have been making following his instructions. But this change takes time. You don't cure in a few days a disease that has been spreading for 30 years.

In recognition of the need to educate very large numbers of people throughout the work force, the National Society of Professional Engineers has joined with a number of other organizations to do something about it. The American Society for Quality Control, the American Statistical Association, the American Association of Community & Junior Colleges, the Institute of Industrial Engineers, the Society for Performance Improvement, and others that I think will be joining us soon, are actively involved in creating the American Quality & Productivity Institute throughout the United States. This institute creates, in each community, a local council that is concerned with quality and aimed at developing educational programs.

By the way, the inspiration for the first of these councils was the Labor Management Committee that Congressman Stan Lundine introduced when he was a mayor years ago.

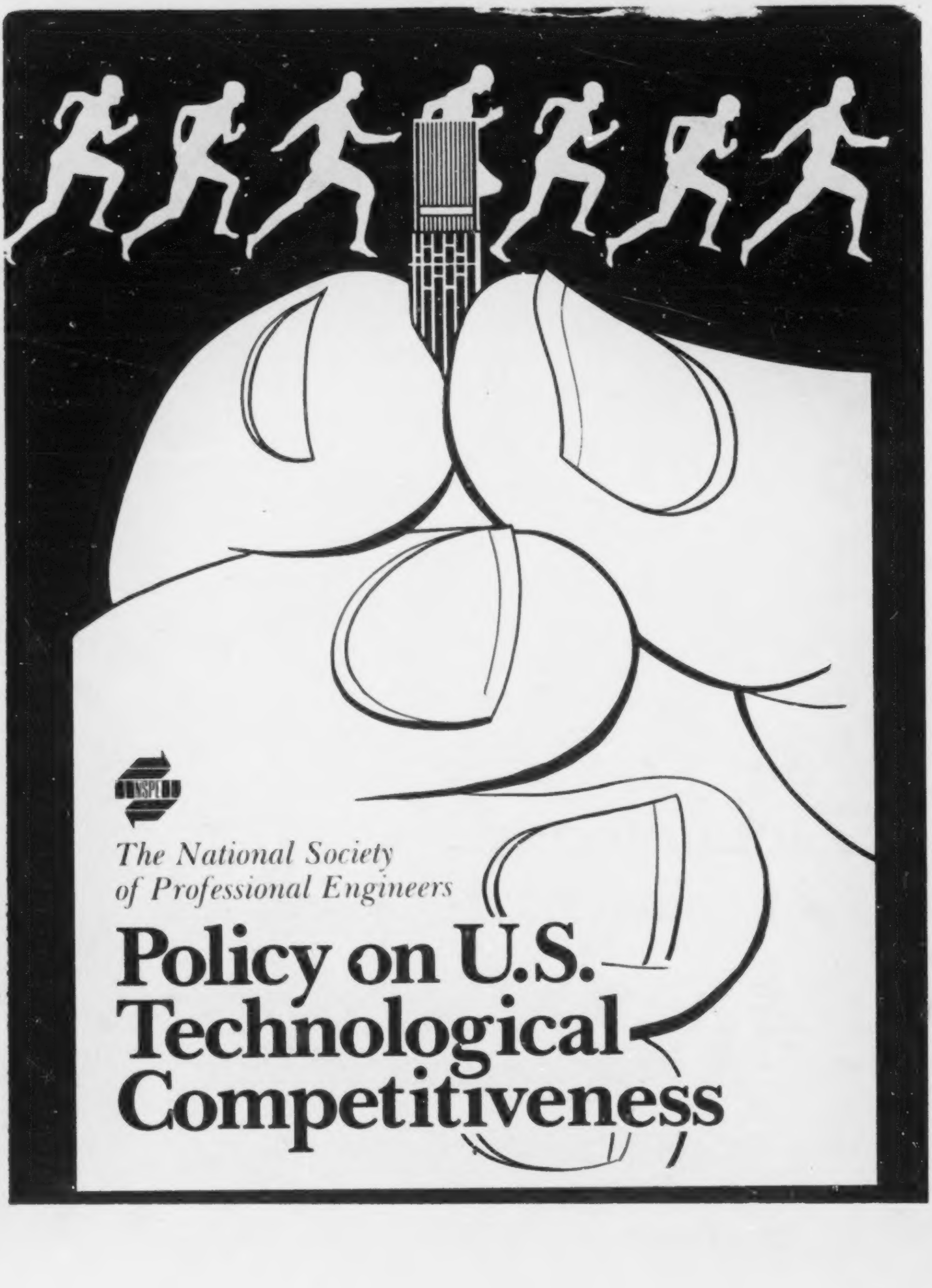
About a dozen quality councils are now in existence. I have given the committee a copy of a report which describes who they are and where they are. We connect them together with an electronic networking so they can talk to one another and exchange ideas about speakers, and programs, and so on.

Doing something about management of our enterprises is the first priority. Let me talk about other priorities now.

I think we must improve the way our Government deals with problems which are a mixture of technology and politics. NSPE has had a longstanding interest in this. Our members, especially those who are in industry, have an insider view of what is wrong, and they know long before the general public is aware that things are going awry, and they are anxious to work on it.

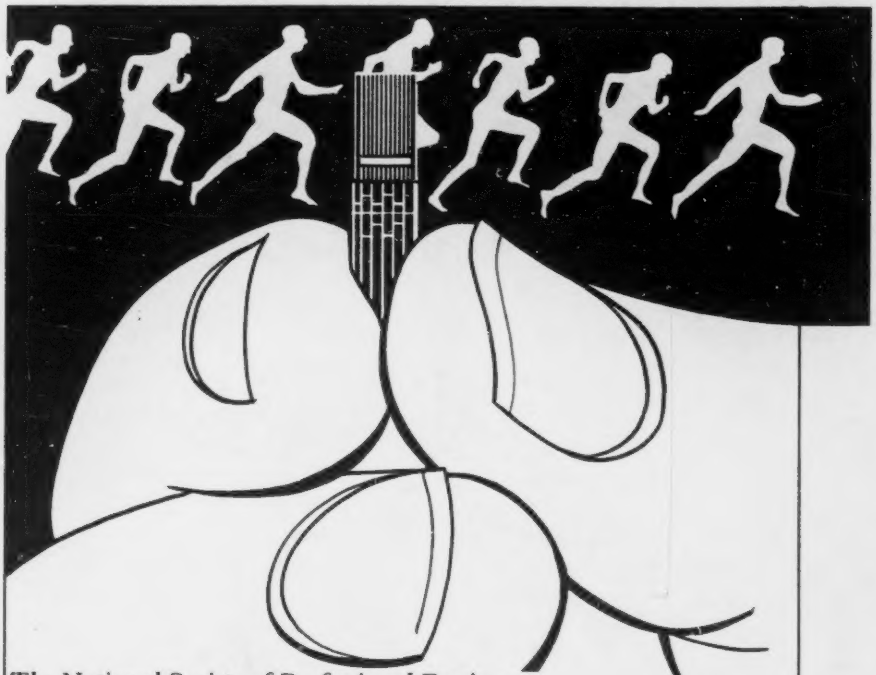
We have furnished the committee with copies of an NSPE report on their topic. Among the people who wrote the report were Eric Bloch, who is now head of NSF, and Allen Rosenstein, who will appear before you in a couple of days.

[The report follows:]



The National Society
of Professional Engineers

Policy on U.S. Technological Competitiveness



The National Society of Professional Engineers

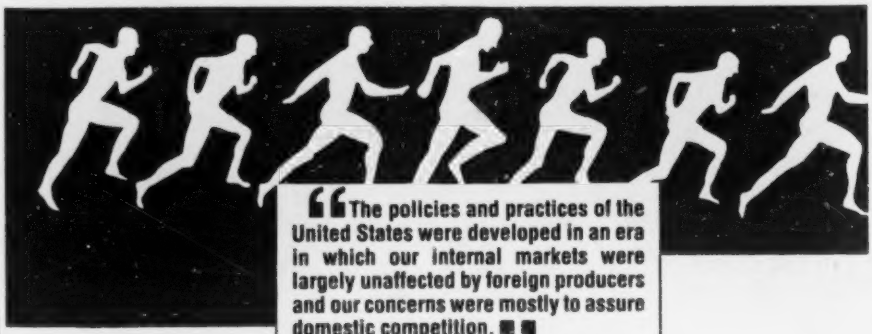
Policy on U.S. Technological Competitiveness

(This Position Paper was developed by the NSPE Technology Policy Task Force and was approved by the NSPE Board of Directors at its July 1983 Meeting.)

Introduction

The National Society of Professional Engineers (NSPE) believes that by working together in specific ways, key elements of our society can assure that the United States of America can remain the leading country in technology, innovation, engineering, manufacturing, and thereby, international trade.

That we shall be able to do so is not a foregone conclusion. In fact, to achieve this end will require new initiatives by both the public and private sectors. Neither can do the job alone. New goals need to be defined and strategies developed to meet them. New ways to cooperate, designed for a modern technological era need to be developed. New forms of cooperative endeavor are urgently needed.



"The policies and practices of the United States were developed in an era in which our internal markets were largely unaffected by foreign producers and our concerns were mostly to assure domestic competition."

The New Era: What Has Changed

In the years since the end of World War II, there have been fundamental changes in international commerce. Other countries have revived their economies, adopted new technologies, entered competitive markets, used American developments and research results and have improved on U.S. methods for production. The world market is a reality and the domestic market is no longer a sufficient and self-contained arena. Foreign producers, with the assistance of their governments, have "targeted" sectors of the global economy.

The policies and practices of the United States were developed in an era in which our internal markets were largely unaffected by foreign producers and our concerns were mostly to assure domestic competition. We have encouraged adversarial relationships that no longer have a *raison d'etre;* in fact, they work to our disadvantage.

Competition is increasingly being felt from outside our borders. In the recent past this competition has affected our more mature industries (textiles, steel, autos). It is ever more apparent that in the newer, high-technology sectors (semiconductors, computers, instrumentation, pharmaceuticals) of our economy many foreign manufacturers are teaming up with their governments, directing their combined energies toward dominance in these new areas.

In the years ahead many of our industries will come under competitive attack as other foreign producers innovate and introduce new technologies. What is different about the era ahead is this: When technological changes originated domestically, it was sufficient for the government to keep a watchful eye for unfair trade practices. Technological change may have disadvantaged one part of the country with respect to another, but it usually advanced the standard of living of the country as a whole. But when whole industry sectors fall victim to skillfully organized competition outside our borders, and when foreign governments are a dominant force in coordinating these efforts, it is time for the U.S. to develop new initiatives and relationships. In short, we cannot go on being an adversarial society surrounded by cooperative attacks on our markets.

The results of new initiatives toward cooperation should not, however, destroy the very basis for our past successes. They should not destroy the free enterprise system. They should give it new impetus. Our proposals are put forward with this admonition firmly in mind.

Objectives, Strategic Thrusts, and Principles

Governments (state, local, federal) have important roles to play, along with private sector institutions (business, labor, education, professional societies). If the United States is to become more competitive, not only must these roles be understood, but common goals must be established and processes used consistent with the realities of technology.

The prime objective of this statement and proposal is to enhance the competitive position of U.S. industry in international commerce.

The strategy for achieving this objective should have four main thrusts:

1. To assure adequate investment in modernizing our manufacturing capacity and in research, development, and innovation.

2. Removal of barriers to the rapid translation of invention and innovation into world competitive products.

3. Increased attention to quality and productivity improvements in all our activities: manufacturing, services, academia, and administration.

4. Continuous education of our labor force, professionals, and managers so they may better deploy advances in technology.

At the outset we wish to again make it clear that we are not talking about centralized planning. For exam-

> **“New initiatives toward cooperation should not destroy the very basis for our past successes. They should not destroy the free enterprise system. They should give it new impetus.”**

ple, we do not wish to see government agencies making pronouncements about which are "sunset" and which are "sunrise" industries. What we are proposing is a new basis for developing cooperative efforts which span government, business, labor, academia, and the professions. Our objective is to promote new forms of free collaboration so that our many important resources may be used together.

The government has a special responsibility to be aware of the health and competitiveness of each industrial sector and of potential threats to its health. It is the responsibility of the private sector to help itself, wherever it can. There will arise circumstances when the government and the public must step in and give assistance. Determining what form that assistance should take so as to enhance and not destroy our entrepreneurial abilities is the essence of the challenge.

Developing a Competitive Response—Some Principles

When a U.S. industry is threatened, other sectors of the economy are also potentially threatened. For example, foreign competition in steel not only threatens steel companies, it affects other industries and many communities where unemployment will occur. Therefore, solutions too narrowly arrived at can do damage to the country as a whole, even if they are viewed favorably by one party or another.

Sometimes the external challenge arises from superior technology or the superior use of technologies. Attempts to meet such challenges by legalistic or financial means (i.e, tariffs, subsidies, etc.) will not cure the problem. They may even make it worse.

Unless the response proposed goes to the heart of the problem and deals with the technological and infrastructure issues, it will merely postpone the day of reckoning, make the situation more difficult to deal with, and place undue burdens on the rest of the economy.

We do not offer a specific organizational arrangement for implementing the strategy. We believe that a number of institutional arrangements are possible. What is important is the process followed in developing and implementing the strategy. Any process that is not to compromise either the requirements of integrity inherent in making any technical decision and at the same time not depriving the rights of free people to respond creatively, should obey four important principles:

1. It should develop awareness in the parties most affected. They should not be taken by surprise by whatever is proposed.

2. Decisions should be based upon reliable and comprehensive data bases and analyses.

3. Barriers to effective cooperation should be recognized, analyzed, and removed.

4. Means for open and effective collaboration among the affected parties should be developed and fostered.

Developing Awareness

Government and industry, together, should sponsor forums in major economic sectors. These meetings should be prepared for the purpose of making the various parties in an affected industry (business, labor, professional societies, government, academia) aware of the nature of the threat and the options available.

At these meetings the facts of the situation should be reviewed, critiqued, and used as the basis for forecasts and the development of options. Weaknesses and strengths in the U.S. position should be identified. The state of technology—past, present, and future—should be discussed. Competitive position in regards to quality, productivity, worldwide share of market, and the impact of alternative actions should be debated.

Every effort should be made to foster collaborative responses.

> **"The government has a special responsibility to be aware of the health and competitiveness of each industrial sector and of potential threats to its health."**

Providing Data and Analyses

In considering the prospects for such conferences, it should be apparent that the integrity and comprehensiveness of the information available to the participants is of great importance. This means that the data base must be developed with care and integrity; it must be designed with the purposes of the meeting in mind. The quality and character of the analytical work will be of equal importance. The government and the private sector should jointly endeavor to increase both the quality and quantity of the data-gathering and analytical work.

The nation has important resources in academia, professional societies, national academies, the National Research Council, and other not-for-profit organizations, which could be used for objective analysis, assessment, and data collection. The government itself maintains many data bases, but these are now largely uncoordinated and not designed to support forums of the type required.

Removing Barriers to Collaborative Responses

There are many barriers to cooperation in our society. Some are based upon historic precedent. Others are based upon fear of laws designed to promote competition and discourage cooperation. Other barriers are simply due to different groups not knowing they have a problem in common or how to go about cooperating.

Through involvement in discussions with management, labor, academia, and professional societies, aimed at dealing with a specific industry, government can assess more objectively what responses are helpful and what stands in the way of such responses.

Sometimes tax incentives, specifically targeted at opportunities or threats, based upon collaborative plans developed through such discussions can help a threatened industry before it is too late.

At times the uncertainties of antitrust interpretation are an undetermined factor in the equation. The government should be so organized that swift responses to inquiries can be made, thus opening the door to new approaches and to industry self-help.

Discussions among industry, government, academia, and the professions may uncover opportunities for collaborative research and development, especially on problems important to the advancement of competitive positions and yet too large to be undertaken by one member of industry. Through discussion and analysis, these opportunities can be identified and supported by joint ventures, often including both government and private support.

Fostering Collaboration

Actions to be taken may involve negotiations with foreign governments. In such cases government has the prime responsibility to take the initiative. Based on the data and analyses, and in discussions with industry, early and effective responses can be put into effect.

An especially vexing issue is to assure fair treatment of U.S. industry under international agreements and laws.

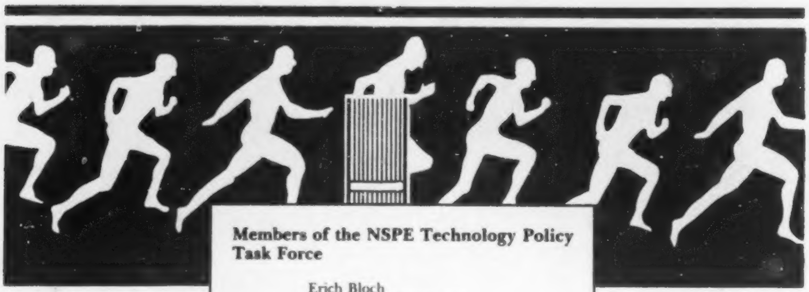
Understanding the differences between a foreign and our own system can lead to new action.

There may be important disparities between the infrastructures available to foreign and domestic producers, as for example, in education, transportation, systems of taxation, etc.

There may be important differences in the education and incentives for young people, i.e., pay and prestige for entering law or management as compared to manufacturing. Federal sponsorship of research (which has a strong effect on education) may distort social values.

Tax incentives for capital formation and for R&D may differ.

Reciprocal access to markets may differ.



Members of the NSPE Technology Policy Task Force

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Myron Tribus, P.E., chairman

Organization Is Not the Issue

Awareness, option development, and consensus can flow from meetings and conferences of affected parties. Forums will be most effective when they deal with industries that feel most threatened or with questions that are most pervasive. We do not propose to lodge the responsibility to convene meetings in any one department of the government. Meetings could properly be convened by:

- The Office of Science and Technology Policy (OSTP), which is by law charged with a concern for the health of U.S. technology; supported by the Department of Commerce, the Department of Defense, and the U.S. Trade Representative;
- National Research Council, under the auspices of the National Academy of Sciences and the National Academy of Engineering, which has been chartered to render assistance to the federal government;
- Business Roundtable;
- The Conference Board;
- Labor organizations;
- Various professional societies, especially NSPE; and
- Various industry associations.

We do believe it would be useful to establish a suitable organization to serve as a clearing house and advisor to the meeting managers to help them hold to the principles described earlier.

Toward a Plan of Action

Having stated the problem and qualitatively the directions of strategic thrusts and approach toward a solution it is important to focus on specific actions that the parties to the problem must undertake.

History shows that when an industry is threatened by foreign competition, a common reaction is to attempt to obtain protection in the form of tariffs, subsidies, special grants. The argument commonly advanced is the importance of the industry to national defense; the importance of maintaining employment, etc. But history also shows that the health of any industry can only be assured if it takes those steps that lead to productivity and quality leadership.

It is the view of NSPE that a number of changes in public and business practices will provide the incentives for the industrial vigor that will maintain or restore U.S. competitiveness in all markets. Among these are the following:

1. Public policy that increases capital availability by making the tax code more conducive to saving.
2. Establishing quality and productivity improvement as a central goal for U.S. industry.
3. Negotiation of international trade agreements that provide fair and reciprocal access to markets.
4. Increased attention to science, mathematics, and computer science in primary and secondary school programs.
5. Revision or extension of engineering curricula to include design and production knowledge in addition to fundamental science and mathematics backgrounds.
6. Cooperative R&D efforts between industrial companies and between industry and academia.
7. Giving equal weight to engineering problems in the councils and departments of government as is now given to science.
8. National laboratories and other technical activities of the government should be given a mandate to support industry where and when appropriate. A strategy for these activities should be jointly developed by industry and government.

Dr. **Tribus.** We started our deliberations by recognizing that America is a technologically based society. Many people wish it weren't so, but that's the way it is. John Kemeny of the Kemeny Commission observed: "The present system does not work. It was designed for a much earlier and simpler age. The only way to save American democracy is to change the fundamental decision process at the Federal level, so it can come to grips with the enormous and complex issues that face the Nation." In short, we think we are becoming like the dinosaur whose brain simply was not large enough to deal with the problems its body encountered.

The essential thing we found is that the processes of consensus building upon which we rely and which is so essential for the survival of democracy, are not adequate to the task. Technology-based societies must often move technical programs through a political process. The political process has its requirements, the technical process has its requirements. They don't blend easily.

If we are to avoid the problems of centralized planning on the one hand and the chaos on the other; if we are to preserve the blessings of freedom and at the same time learn to work together in harmony, we have to take into account that the political process is as essential as the technical process. We need both.

We also have to keep in mind physical laws cannot be repealed by congressional action.

The NSPE report laid out four principles:

First, any process involving technology and politics must develop awareness in the parties most affected. People should not be taken by surprise by what is proposed.

Second, decisions should be based upon reliable and comprehensive data bases and analysis.

Third, barriers to effective cooperation should be recognized, analyzed, and removed.

And, fourth, means for open and effective collaboration among the affected parties should be developed and fostered.

We then went on to describe how these processes could be brought about but we didn't propose a specific organization to achieve them. We think many different forms of organization could be used.

Now let me close by commenting on H.R. 3997, the National Policy and Foundation Act. The bill would consolidate in one agency several agencies of Government which are distinguished by their involvement in technology, either through research and development or through policy studies.

The bill would also bring together many agencies which are involved in data gathering. They would be charged with the duty to examine important policy implications, and technological decisions, and important technological consequences of what might at first appear to be nontechnical issues. They would be expected to play a lead role in developing a consensus and reporting to the Congress and the administration on that consensus, along with the factual data and analyses which support it, and the arguments pro and con.

The agency is designed to help promote the development of consensus. If properly managed, we think the Foundation could implement the proposals made in the NSPE report.

We believe H.R. 3997 is a step in the right direction. If it were implemented it would serve a useful purpose. We endorse it.

Let me close now. We are now starting to hear that we are about to enter an era which could be called Pax Nipponica, replacing the Pax Brittanica of the 19th century, and the Pax Americana that existed through the middle of this century. We hear it is to be a period of Japanese domination.

My purpose is to tell you that this is not a necessary consequence. We have the know-how to equal or beat the Japanese. Most Japanese do not want to dominate the world. Unless we return to good American management that continually improves processes and products, it is more or less inevitable that we and our children will soon live in a thoroughly dominated Japanese world.

Thank you for your attention.

[The prepared statement of Dr. Tribus follows:]

NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

TESTIMONY OF DR. MYRON TRIBUS

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REPRESENTING

THE NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS
ALEXANDRIA, VA.

June 24, 1986
U.S. House of Representatives
Committee on Science and Technology

1420 KING STREET ■ ALEXANDRIA, VIRGINIA 22314 ■ 703/684-2800

INTRODUCTION

Mr. Chairman: My name is Myron Tribus. Currently I am the Director of the Center for Advanced Engineering Study at MIT. Before joining MIT I was a Senior Vice President for Research and Engineering at the Xerox Corporation. Prior to joining Xerox I served here in Washington for two years as the Assistant Secretary of Commerce for Science and Technology, a most educational experience. Before that I was for eight years the Dean of Engineering at Dartmouth College. Just after WWII I served on the faculty of the College of Engineering at UCLA for 16 years. During World War II I was a Captain in the Air Force assigned as a design and development engineer at Wright Field. I have been a designer of jet engines for the General Electric company. I serve on the board of directors of two companies. I have just become a partner in a small company that is bringing to the market a new kind of power plant of greatly increased efficiency. In addition, I maintain a consulting practice in quality management.

To begin, I must say that what I have to say does not represent the official views of MIT. Today I am speaking for the National Society of Professional Engineers, which represents 75,000 engineers of all disciplines, who are employed in private practice, industry, education and construction, as well as in government. We are organized into 54 states and territorial societies, and over 535 local chapters across the nation, and are dedicated to the professional concerns of engineers and public service.

My own views have been developed over two decades in which I have seen the competitive position of my country deteriorate each year. We have reached the proportions of a full blown crisis and I am pleased that your committee is focussing attention on this important problem.

DIAGNOSIS

You will hear from many other people concerning what is the cause of this decline. It was visible when I served in Washington, 16 years ago. I was very fortunate to have on my staff Dr. Michael Boretsky, an economist in the Department of Commerce, who patiently traced our international trade over the last century and demonstrated that as early as the late 1950's there were indications that we were headed for trouble. You would do well to consult him, even though he has retired from the Department of Commerce. He gave me my first understanding of the situation. It have been a long time in building; it will not go away easily.

Many well intentioned people say that the problem is the loss of the work ethic, the overvalued Yen, hidden subsidies by the Japanese and other Governments. We also know about problems caused by high interest rates and taxes. There is another factor, however, which has not had proper recognition. It is the way our managerial corps looks at how they are supposed to run our enterprises.

They do not understand that in this new era of fierce economic competition, there is only one viable philosophy: Constant improvement.

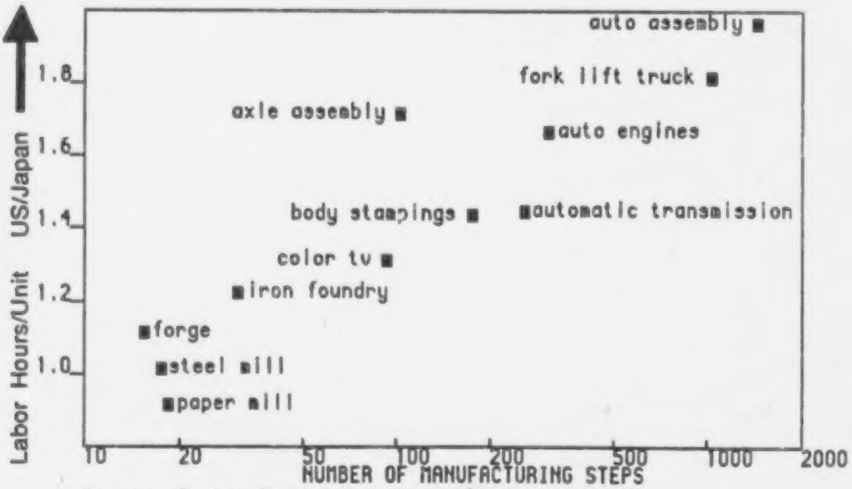
**COMPETITIVE ADVANTAGE COMES ONLY
TO THOSE ENTERPRISES IN WHICH
EVERYONE, FROM THE TOP TO THE BOTTOM,
IS ENGAGED IN IMPROVING THE PROCESSES
IN WHICH THEY WORK OR
FOR WHICH THEY ARE RESPONSIBLE.**

Modern enterprises are now so complex and under such severe competitive pressure that unless everyone in the enterprise is working cooperatively on improvement, the enterprise will be left behind. I do not know of any school of business which teaches its students how to lead employees in finding ways to improve the business.

What does this failure to adopt a philosophy of constant improvement mean? Here are some data.

Figure 1 shows the ratio of labor hours used to produce a unit of output (American labor/Japanese labor) for a variety of products. The horizontal scale indicates the number of separate operations required to produce a unit. With more manufacturing steps, there are more opportunities for improvement. Companies organized for continuous improvement, which involve the entire work force in the process have an unbeatable advantage over those who do not.

MANUFACTURING COORDINATION



Source: Boston Consulting Group (S Wheelwright)

Table 1 shows a comparison of the quality and productivity of four TV manufacturing companies in the United Kingdom.

TABLE 1

FOUR TV MANUFACTURERS OPERATING IN THE UK

	J1	J2	US	UK
Number of Employees	700	300	700	2000
Quality index (1)	5.5	10	13.5	85
Labor productivity (2)	83	107	71	56
Labor turnover,%	30	27	30	30

(1) Percent of sets requiring repair
(2) Sets/labor day

[Reference: Takamiya, Makoto "Japanese Multinationals in Europe: Internal Operations and their Public Policy Implications" Wissenschaftszentrum Berlin, September 1979. Discussion Paper Series, International Institute of Management]

Two of the factories described in table 1 were managed by Japanese, one by Americans and the fourth by British managers. The Japanese were the best, the Americans second and the British the poorest. The British factory was the most automated. All the workers and lower managers were British.

TABLE 2 shows a comparison between Japanese and American automobile manufacturers. This comparison was made in 1983 by Jim Harbour Associates of Detroit. Representatives of three American automobile manufacturing plants have recently confirmed these data are still applicable.

TABLE 2

COST ADVANTAGES IN MANAGING FOR QUALITY FIRST

Labor (60 vs 120 hours)	$ 550
Inspection and rework	329
Excess inventory	550
Fewer job classifications	478
"Shut down line" vs "tag operation"	98
Advanced technology (robots)	73
Extra labor for materials handling	41
Absenteeism	81
Union Representative	12
Total	$2212
Transportation	-485
Net Cost Advantage	$1727

The differences in management ability show up in other ways, too. For example, table 3 shows the effects on size of factory and size of work force.

TABLE 3

COST ADVANTAGES MANAGING FOR QUALITY

	JAPANESE	AMERICAN	
DAILY PRODUCTION	1000	1200	units
FACTORY SIZE	1.5	3.0	10^6sq ft
DIRECT LABOR	1112	2600	people
INDIRECT HOURLY	625	2125	people
INDIRECT SALARIED	175	525	people

Recently we have begun to get information from the factories that the Japanese have set up in our own country. The plant that the Japanese built for General Motors in Fremont, California, has about half the labor force of a normal GM production facility and is producing high quality low cost cars. It is also not as advanced technologically as other GM plants. Honda of America has reported that in their plants they are producing cars with about the same efficiency as in Japan. I have even heard that Nissan in Tennessee has reported getting better results with American workers than with Japanese.

I have one more example which I think makes the case very well. The data were given to me by Mr. Ken Sasaoka, President of Yokagawa Hewlett-Packard (YHP), the Japanese affiliate (not subsidiary) of Hewlett Packard. In 1975 there was a comparison made among the various divisions of Hewlett-Packard and, as shown in figure 2, YHP was the worst. They had the biggest field failure rate and the lowest profitability of all the HP divisions. That poor showing convinced Mr. Sasaoka that he and his managers needed to learn better ways to manage.

Five years later they had so improved that they won the Deming Prize and when a similar study was made again, the data appeared as in figure 3. No one should claim it was the strength of the Yen, the differences in culture or changes in Government policy. These were essentially the same people. **The only thing that changed was the way the place was managed**. Mr. Sasaoka graciously spent almost a full day with me, describing in great detail precisely what changes he had found it necessary to make to improve the company. He was frank to admit that the first change was in himself and how he understood his job. From him I learned that the first step for all managers, is the commitment to learn.

INTERDIVISIONAL COMPARISONS

1975

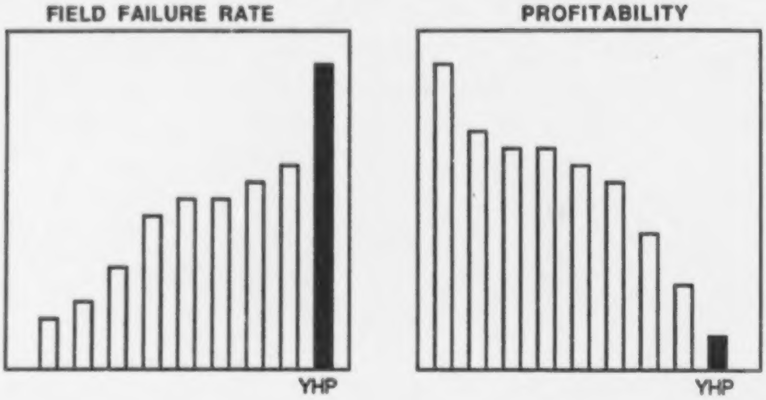


Figure 2. How Yokagawa Hewlett-Packard compared to other Hewlett Packard divisions. In 1975 they were the worst in profitability and in field failure rate. [Data are disguised.]

1980

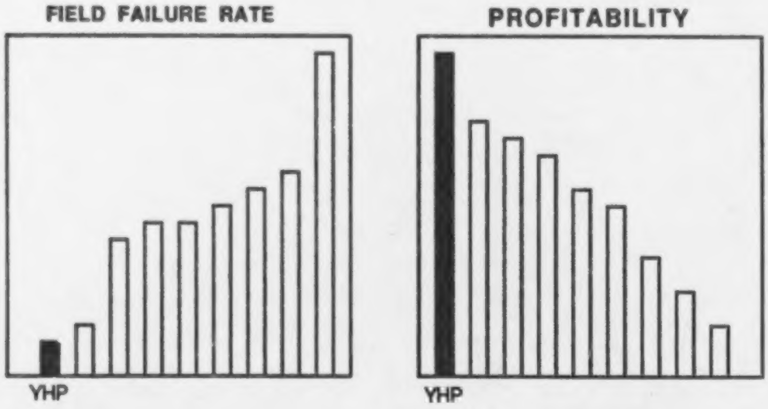


Figure 3. The standing of YHP among Hewlett-Packard divisions in 1980 after they had won the Deming Prize. It was the same work force and the same managers. Only the style of management at YHP had changed. They became the best in profitability and had the lowest field failure rate of all HP divisions.

THE CURE: CHANGE THE WAY WE MANAGE OUR ENTERPRISES

I trust that by now I have made the point: **The first priority in regaining American competitiveness is to change the way our managers do their jobs**. If we do not do this, nothing else we do will be effective. This is not all we must do. There are many other considerations, and I intend to come to some of them in a moment. But compared to the others, this is the first priority.

Some people think we are describing a cultural phenomenon called "Japanese Management". Not true. The origins of so-called Japanese management are strictly American. It started in 1948, during the McArthur occupation. Charles Protzman, a senior manufacturing executive from Western Electric and Homer Sarasohn, a development engineer, both on the staff of General McArthur, found it necessary to institute a course in management for the Japanese. The circumstances were these: The Japanese economy was in a shambles. The American army was feeding the Japanese people. To encourage economic development, McArthur decided that the Army of Occupation should purchase as many things as possible from the Japanese. However, Japanese quality was unacceptable. Protzman and Sarasohn were asked to investigate and find out why. They concluded that Japanese managerial techniques needed a complete overhaul.

In those days, as in Europe, managerial positions went to people who were of certain privileged Japanese families. Contrariwise, in the USA, until the middle 1950's, heads of American companies came from the ranks of the companies and were composed of people who understood the business they were in. Promoting from within was a new idea for the Japanese. As the top ranks of Japanese business were purged by the American occupation forces, the promotions into these vacancies came from the ranks of the company. In the September 1985 issue of Quality Progress, published by the American Society for Quality Control, you will find an extensive description of the courses of instruction and some pictures of the students. They include A. Morita, now honorary chairman of Sony, M. Matsushita, present chairman of Matsushita Electric and representatives from Sharp, Toshiba, Sumitomo Electric and many others. This was the true beginning of so-called Japanese management. It was forced on them by their conquerors.

Introducing ideas about industrial democracy, which were prevalent in the US at the time, was not enough for a complete theory of management. In 1950 Dr. Deming went to Japan and introduced statistical quality control. He showed the Japanese managers how statistical concepts formed a central core of a new managerial theory. Dr. Joseph Juran also went to Japan and taught simple statistical methods.

The US Army introduced work simplification methods. Larry Miles was invited by the Japanese to teach value analysis. The Japanese managers understood that these were important tools for continuous improvement.

In the USA our managers began to abandon these ideas as soon as the war was over. In Japan they developed and extended them. Today's generation of writers, toO unaware of and uninterested in our history, describes it as"Japanese Management". It isn't. It is just good management. We invented it. We abandoned it. They cherished and polished it and gave it a few Japanese twists.

With mastery of process improvement, not just mastery of process, they are now in a strong position to invent and innovate much more rapidly than we. Our management is wedded to the idea of a "steady state", not "continuous improvement" as a way of life. American managers want me to show them how to make a system better; Japanese want to know how to be better at improvement.

WHAT WENT WRONG? WHY DID WE CHANGE OUR MANAGERIAL APPROACHES?

And what caused the abandonment of the track we originated? I must place most of the blame on our Schools of Business. They have sought to develop an elite corps of "professional managers", credentialized by Harvard, Wharton and the Sloan School at MIT. Their concept is that if you can manage, you can manage anything. If you ask them they say they are teaching the top managers of the future. Their objective is to have as alumni the heads of the Fortune 500 companies. I suppose these are noble aims, but unfortunately they teach their students to regard the enterprise as primarily an "investment portfolio" to be managed mostly from financial figures. Financial figures are "lagging indicators" and trying to run your company by looking at the resulting financial figures is very much like trying to drive your car guided by the white line you see in the rear view mirror. It doesn't work. In Japan before the war the executives were people who had their primary experience at the Zaibatsu, that is the corporate headquarters of their companies. They were the elite. Now the Japanese do not follow this custom. They follow the American tradition of the 1940's. We in turn have abandoned the tradition. The passport to the job at the top is a degree from a first class business school. We have created our own Zaibatsu.

WHAT IS THIS "NEW" WAY TO MANAGE?

Sometimes people ask me to explain in a few words what is really different about this long forgotten theory of management and I find I cannot. The problem is not that there are so many really new ideas. The task is not to teach, it is to unteach. I think I know now what it must have been like 500 years ago when Columbus tried to explain that the Earth is not flat. Changing a conceptual framework is a frightening undertaking for most people.

The best I can do today is give you a few catch phrases which might just give a glimpse into what is different. I am supplying the committee with a set of eight papers describing these ideas in much greater detail.

First I want to cite a few ideas that need to be reconsidered. I have already mentioned the constant improvement principle. It requires a new self image for the manager. There are other things that need to be reconsidered as well.

1. We are in a new era, the era of the knowledge worker. Ever since the building of the Pyramids, people have treated management as though

MANAGEMENT IS A PRIVILEGE
LABOR IS A COMMODITY

THIS VIEW IS NOW UNTENABLE
INSTEAD, THE MANAGER'S JOB MUST BE REDEFINED

THE PEOPLE WORK IN A SYSTEM.
THE MANAGER'S JOB IS TO WORK ON THE SYSTEM
TO IMPROVE IT CONTINUOUSLY,
WITH THEIR HELP.

This view of the job contrasts with the usual view "If it ain't broke, don't fix it". Most managers do not think they are in charge of a system. They just think about getting the work done and getting themselves promoted. Incidentally, have you noticed how most of the popular business books are not concerned with improving the business but just with helping the reader to get ahead, up the corporate ladder?

2. Quality is the driving force for competitiveness

QUALITY IS NEVER YOUR PROBLEM.
QUALITY IS THE ANSWER TO YOUR PROBLEM

Very few managers today understand that when you concentrate on improving the quality of everything you do, your problems tend to go away. Costs are reduced, errors are prevented, products work better. It then becomes possible to make products that do not come back for customers who do. Some US companies, such as Ford and IBM have now learned this lesson, but only recently. Their problem is that their Japanese competitors have been applying this principle throughout their companies for over 30 years and in the USA we are just beginning.

Too many mangers think of quality only in regard to the product that goes out the door. They fail to recognize that improving the quality of everything the company does is essential to building and retaining customer loyalty.

3. The quality cost principle:

FOR A GIVEN SET OF FEATURES,
THE PRODUCER OF HIGHEST QUALITY
WILL BE THE PRODUCER OF LOWEST COST.

Please note that I did not say "lowest price". It is no mistake that the Honda is at once the highest quality and lowest cost vehicle in its class. They go together. With low cost a manufacturer can decide to produce a product with few features and sell it at a low price, as with the Honda Civic or add features and sell it at a high price, as with the Accord. In either case, high quality in production processes produces a low manufacturing cost and a high quality product.

Although there has been a determined attempt to publicize the fact that increasing quality does not drive up cost, I can report that most managers do not believe it. They do not see improved quality as a means to reduce cost.

4. The essential quality concept:

ONLY CUSTOMERS CAN DEFINE QUALITY
THE NEXT PERSON IN LINE
IS YOUR CUSTOMER

Successful companies are customer oriented. They work to please their customers. Most American companies are share price oriented. They work to please the equity market.

This principle also redefines the condition of work. Everyone must be taught to find out what the next person in line needs to do a good job and then concentrate on providing it. In the well-managed enterprise, each person works to help the next person in line do a better job. They know they are all in the same boat and that they must row together, in the same direction.

5. One of Dr. Deming's most important principles:

DRIVE OUT FEAR

is simply not discussed in most companies.

In the first case, there is a fear that management cannot eliminate. It is the fear that the company will fail and all the employees will lose their jobs. That is not the kind of fear to which Deming refers. The most common fear, the most debilitating one for a company is the fear on the part of the employees that the only purpose the management has is to get rid of them. When workers in Japan and Germany were interviewed and asked, "Is an increase in productivity in the company good for you personally, 90% of the Germans said "No" and 90% of the Japanese said "Yes".

There are other important sources of fear, among them, the fear to tell the management things they do not want to hear. The commission that investigated the Challenger disaster did not recognize the most important shortcoming of NASA management. If you want to understand what went wrong, you should ask this question: How is it that NASA management allowed a system to develop in which it was dangerous for engineers to tell the truth?

I have worked in systems which promote fear, so I understand them well. It is not a new phenomenon. We had the infamous case of the BART engineers who had to fight to make the top management accept that the system that had been proposed was unsafe. This shortcoming in management is so well known, it has even been the central theme of a novel. I recommend to you the book by Neville Shute, "Slide Rule", which tells about the disaster that occurred in the 1930's when the British tried to build a derigible to compete with the Germans who were stealing their passengers in the trans-Atlantic crossing. When the R-101 blew up and killed half the design team, it was a disaster just like the Challenger. The reasons were also the same.

Some companies in Japan, by the way, also create a great deal of fear in their employees. Japanese companies are not all well run. Some even go bankrupt. Well managed companies are aware of Deming's point about fear and they work actively to eliminate it.

6. The statistical principle:

ALL SYSTEMS EXHIBIT VARIABILITY.
KNOWING HOW TO TELL IF A VARIATION
IS A SIGNAL THAT SOMETHING IS WRONG
OR IS PART OF THE EXPECTED VARIATION
DISTINGUISHES THE GOOD MANAGER FROM THE INEPT.

At the heart of Dr. Deming's and Dr. Juran's teachings is the intelligent use of statistics. One of the weaknesses of American Engineering Education is the failure to include instruction in statistics in the normal education of engineers. As far as I can tell, this has not even become a topic of discussion amongst engineering educators, let alone a basis for action, in the engineering schools in the USA. The American Statistical Association has set up a special committee to design new courses of instruction for engineers, but they do not control the education of engineers and thus far the schools of engineering have not shown much inclination to buy what the ASA has to offer. There are some stirrings at Wisconsin and Iowa, but they represent but a few percent of the students. There are about 1 million engineers in the USA. We produce about 60,000 new ones per year. Less than 5% of them will have had a course in statistics, and of those, only a few will know how to apply it to problems of manufacturing and quality.

7. Juran's principle:

WHENEVER THERE IS A PROBLEM,
85% OF THE TIME IT WILL BE THE SYSTEM
15% OF THE TIME IT WILL BE THE WORKERS.

Since the workers are the people most involved in the system, they are the ones most likely to be able to say what is wrong. This understanding provides the central idea behind the quality circle movement.

As I said, these phrases and comments give only the flavor of what needs to be learned.

THE NEWS IS NOT ALL BAD: SOME GOOD THINGS ARE HAPPENING

I am pleased to be able to report that these ideas are beginning to catch on in some parts of American management. You will hear in the next day or so from representatives of Florida Power and Light where the management has accepted the need to change. If you were to call upon the top management of the Ford Motor Company, or better yet, visit one of their plants, you would see some of these ideas in action. I am working with several US companies and as the managements change their ways, so do their fortunes.

The extension service of George Washington University has been presenting seminars featuring Dr. Deming and, by conservative estimate, has reached well over 20,000 people in the last few years. At our Center we have made videotapes of Dr. Deming and others and our estimate is that we have reached about 30,000 people over the last few years. Dr. Juran operates the Juran Institute which each year holds a conference at which hundreds of people report on the progress they have been making in their companies.

Unfortunately, all this takes time. You do not cure in a few days a disease that has been spreading for 30 years.

THE AMERICAN QUALITY AND PRODUCTIVITY INSTITUTE (AQPI)

In recognition of the need to educate very large numbers of people throughout the workforce, the NSPE has joined with a number of other organizations to do something about it. The American Society for Quality Control, the American Statistical Association, the American Association of Community and Junior Colleges, the Institute of Industrial Engineers, the Society for Performance Improvement have joined forces with the NSPE to create the American Quality and Productivity Institute (AQPI). Throughout the United States local quality councils are being formed, aimed at developing educational programs in their communities.

I should say in passing that the inspiration for the first of these councils was the Labor Management Committee in Johnson City that Congressman Stan Lundine organized when he was Mayor there.

About a dozen quality councils are now in existence in as many places in the country. An electronic network is available to allow them to communicate with one another. A program to "train the trainers" has been mounted by the American Association of Junior and Community Colleges and has developed trainers in over 100 locations in the United States. I understand that they may have a representative to talk to you tomorrow or the next day, so I shall say no more on that score at this time.

As I said at the beginning, doing something about the management of our enterprises is only the first priority action. It is not the only action that is required. I want to speak now of other issues.

IMPROVING THE WAY OUR GOVERNMENT DEALS WITH PROBLEMS WHICH ARE A MIXTURE OF TECHNOLOGY AND POLITICS.

The NSPE has had a long standing interest in problems of international trade and competitiveness. Our members, especially those who are in industry, have an inside view of what is wrong. For a long time they have been eager to find a way to help. About two years ago the NSPE funded a study of what might be done. We are furnishing the committee staff with copies of our report. Among the committee members who wrote the report were Erick Bloch, now head of NSF and Allen Rosenstein, who will appear before you two days hence.

We began our work by recognizing that America is a technologically based society. There are people who wish it weren't so. They would like us to return to being an agrarian society. But as we look around the world at agrarian societies, we see that if they have 230 million people, they have a very harsh life. So the alternative is not to return to what cannot be but to learn how to make life livable with what we have. We concluded that the most important task facing our society was to learn how to move technical questions through a political process. As John Kemeny of the Kemeny commission observed: "The present system does not work. It was designed for a much earlier and simpler age. The only way to save American democracy is to change the fundamental decison-making process at the Federal level, so it can come to grips with the enormous and complex issues that face the Nation". In short, we are becoming like the dinosour whose brain simply was not large enough to deal with the problems its body encountered.

The essential thing we found was that the processes of consensus building upon which we have relied and which are so essential for the survival of a democracy, were not adequate to the task. The political process has its requirements; so does the technical process. They do not come together easily. If we are to avoid the problems of centralized planning on the one hand, and chaos on the other; if we are to preserve the blessings of liberty and freedom and at the same time learn to work in harmony, we need to take into account that the political process is an essential process in the development of a consensus. What is required is a process that takes into account both technology and politics. We need both.

We also have to bear in mind that physical laws cannot be made or repealed by Congressional action. Disasters like the Challenger owe their existence to a bad mixture of political and technical processes. It is wrong to think of the terrible loss of life as due primarily to a technical error. It was a technical error brought on by political pressure, almost identical to the tragedy of the R101 described by Neville Shute.

Other tragedies, less spectacular occur every day and go unnoticed because, unlike the challenger, a faulty decision may take five years to produce its effect and by then everyone has forgotten what was done. The late Frank Huddle of the Library of Congress reference service described 15 such examples in his brilliant report "Technical Information for the Congress", published almost 18 years ago.

The NSPE report laid out four principles:

Any process that is not to compromise either the requirements of integrity inherent in making any technical decision and at the same time not deprive the rights of free prople to respond creatively, should obey four important principles:

1. It should develop awareness in the parties most affected. They should not be taken by surprise by whatever is proposed.
2. Decisons should be based upon reliable and comprehensive data bases and analyses.
3. Barriers to effective cooperation should be recognized, analyzed, and removed.
4. Means for open and effective collaboration among the affected parties should be developed and fostered.

Our report then went on to describe how these processes could be brought about. We did not propose any specific organization to alchieve them. Because of lack of time, I shall not go into greater detail regarding how to comply with these objectives.

COMMENTS ON HR3997 "NATIONAL POLICY AND TECHNOLOGY FOUNDATION ACT"

With these criteria in mind, I should now like to comment briefly on H.R.3997, the "National Policy and Technology Foundation Act".

The bill would consolidate in one agency several agencies of government which are distinguished by their involvement in technology, either through research and development or through policy studies. The bill would also bring together many agencies which are involved in data gathering. The agency would be charged with the duty to examine important policy implications in technological decisions and important technological consequences of what might, at first, appear to be non-technical issues. The agency is expected to play a lead role in developing a consensus and reporting to the Congress and the Administration on that consensus, along with the factual data and analyses which support it and the arguments, pro and con that have been put forward.

The agency is designed to help promote the development of consensus among different parts of our society through active participation by interested parties. If properly managed, the

Foundation could implement the proposals made in the NSPE report.

We think H.R.3997 is a step in the right direction. It contains many provisions which would support our previous proposals. If the bill were implemented it would serve a useful purpose. We endorse it and hope that it will be made into law.

I want to close by adding my own strong personal endorsement. I have seen what John Kemeny has seen: The present system does not work. Our survival depends upon changing it.

Thank you for your attention.

Mr. BROWN. I note that you also state that you are going to retire from MIT in a few days and spend more time as director of the AQPI. I trust that that will give you the opportunity to do for the United States what Deming did for Japan, and that we will see some of the fruits of that in the years to come.

I look forward to continuing to work with you in that capacity.

Mr. Ritter, do you have any questions of Dr. Tribus?

Mr. RITTER. Not at the moment, but I just want to commend you on really excellent testimony. For those of us who sit here and listen to hours upon hours of testimony, it's a unique experience to have something that sends bells and whistles ringing in your head, and light bulbs going off, and I think you've really stimulated us.

I only wish your testimony, and I intend to put it in the Congressional Record, for what that's worth—but I only wish the U.S. House of Representatives could listen to that testimony in a relaxed fashion without getting called off in 20 different places, because I think it's absolutely extraordinary, and it does hit the nail on the head, in my opinion.

Thank you, Mr. Chairman.

Mr. BROWN. Dr. Tribus, I second what Mr. Ritter has said. And I think we should do everything we can to give wider distribution of your testimony. It leaves us still puzzled about the role that the Congress and the National Government can play in this process of—which you've described here, of improving our productivity.

We have a number of legislative proposals—dozens of them, actually. Our problem is reaching some sort of a consensus as to what steps we can take that are compatible with our own political system—political philosophy—and which will be effective, which will, of course, be compatible with our present financial and other situations.

We don't have the answer to that question yet. The proposals that I have made which essentially call for a sort of consolidation and focus of existing governmental institutions to deal with this problem is not really lighting fires and sending—causing whistles to blow, and so forth, in the administration. Yet, at the same time, there is perception reflected in numerous reports mandated by this administration of the essential steps that need to be taken.

There are actually initiatives such as that generated by Dr. Keyworth to begin to focus on this problem using the national laboratories as a resource. There are a number of positive steps but our genius is going to have to be to pull these together into something that can be broadly accepted.

I think the National Society of Professional Engineers deserves a good deal of credit for the role that they played here. And I hope they will continue that role, both in terms of sponsoring the activities in the private sector and their willingness to endorse a legislative or governmental approach to this. And I—I would note at this point they have done some other things like stimulating the improvement of the teaching of mathematics throughout the country, which is a vitally important aspect of our overall development. You couldn't have good statistical quality control without good mathematicians, for example.

My—what I am trying to get at here is any contributions you might have to a legislative strategy that would enable us to move forward more—more promptly on this. You have made one of the finest statements that we have with regard to the nature of the problem. You have endorsed the particular approach to it, which I think all of us recognize would not be the total solution, but merely be a step in the direction of it.

Do you have any feeling of how far the Federal Government could go and what the next steps might be that would be compatible with the existing political situation?

Mr. TRIBUS. Yes, I do; the first thing I would like to say is that the Congress influences things by ways other than legislation. It also influences things by the kinds of questions it asks at the right places. So you should continue inquiries such as this one.

These principles of management do work in Government itself. I am aware, for example, of some very important work that is going on in Wisconsin in the improvement of city government. You can talk with the people there. We have good evidence that these ideas can be applied in Government itself.

There are people in the Government at low levels who go to Deming seminars, and learn from him. They come to me and they ask "Will you help?" I have made an analysis of the Defense Logistics Agency's approach to procurement. The Department of Defense spends a half a billion dollars a day in our economy. And the way it is spent, many times, guarantees high costs, low quality, and noncompetitiveness. They are a bad influence.

I am not the only one to say this. I was with a group of engineers just the other day in a major corporation—a very fine defense corporation—who say the same thing.

I have discussed this previously. You will find an analysis of the DOD's situation in one of the papers that I gave you. There's another paper also that I gave you coauthored with the late Herb Holloman regarding what the Federal Government can do. We have some specific suggestions in that paper.

But the most important thing you can do is to ask some hard, penetrating questions of people, both in Government and in private sector. You could use the Office of Technology Assessment, which occasionally gathers data and does some of the things in a very low level and without the funding and the resources that would be generated in H.R. 3997.

You could ask some questions of the managers when companies are supposed to compete but don't do well. Let me give you an example. I hesitate to give too many examples because I consult for some of these people and I should not parade them in their underwear, so I will just speak in general terms. For example, I talked to a manager who complains that the Japanese are stealing certain electronic markets. He's got all kinds of reasons for it. So I ask him, "What is the yield on your line? What is the fraction of the time that your lines are down compared to your Japanese competitor?" And he says, "Oh, yeah, we're not doing so good there."

Well, the big problem is right there. When your lines are not giving you high yield and when they're not running, your overhead goes up, your cost per unit goes up, and you are not cost competitive.

I visited Texas Instruments of Japan. When you're a good friend of Dr. Deming, it's a wonderful advantage when you go to Japan because you walk in and you say to the top management, "My good friend, Dr. Deming, said I should talk to you." At that they open up the kimono, they show you everything inside the plant.

At TI, they set up a special presentation for me by 12 of their technicians. None of these people had higher than a high school education. They were not highly educated people, just high school graduates. But they had been taught within the company how to improve things. And they solve these problems I know we over here would use only master's degree candidates on. It would cost us 10 times as much and we might never have found the simple solutions that they have.

It is this way of thinking about how to use the labor force to improve things that is so important. The Congress can ask questions that would reveal this. And then people like myself would be helped. Until the pressure is on, our managers don't change.

In six companies in Japan that won the Deming Prize, I asked them, "Why did you change?" Every manager told me the same story—they were looking into the abyss. They did not jump on this bandwagon because they thought it was a good idea. They did it because they had to. For the same reason that Don Petersen of Ford Motor Co. changed. He was desperate. I know because I talked about it with him. He faced disaster, then he changed.

So you need to help people to understand that they are in a desperate situation by bringing out the kind of data that they don't necessarily want to bring out themselves.

Mr. BROWN. In other words, it might be good for us if we were—perceived the possibility of defeat in a war against the Japanese?

Dr. TRIBUS. Yes, sir.

Mr. BROWN. Even if it was just a commercial war.

Dr. TRIBUS. To lose in an economic war is more devastating sometimes than to lose a military war because when you lose a military war you know who the enemy was. You've come through something terrible. The survivors have a sense of getting together to rebuild.

But when you lose a commercial war, you destroy your infrastructure. You look at one another as the enemy, and you destroy your cohesiveness, and you just simply degrade. It doesn't have that sharp beginning and sharp end character.

Mr. BROWN. One other——

Mr. RITTER. Mr. Chairman.

Mr. BROWN. Mr. Ritter.

Mr. RITTER. If the chairman would yield on that point. So basically what would be most advantageous at this stage is if we could lose a military war to Japan and get rebuilt by them. I mean, I say that with my tongue coming out of my cheek, but——

Dr. TRIBUS. They are too smart to do that. [Laughter.]

Mr. BROWN. I hope we're too smart to allow that to happen, too.

One of the proposals that the committee is looking at, Dr. Tribus—I'm not sure whether you commented on it or not—is a proposal to create a National Quality Award to recognize American business and industry for outstanding achievement and effective quality control.

That, again, is a symbolic and small step. But do you feel that that would be a worthwhile contribution?

Dr. TRIBUS. Yes, it would; it would be a very good thing to do. It turned out that in Japan, when a manager wanted to change something in the company, it was extremely useful to have a unifying theme, such as let's go for such and such an award.

In conjunction with the White House Conference on Productivity, I prepared detailed proposals for such an award based on my study of what has happening in Japan. But the administration simply didn't want anything to do with it. NASA has picked the idea of an award. I think it is just wrong for NASA, particularly in view of what has happened, to be the lead agency in giving an award.

I propose that the award be given in the private sector. I am prepared to organize groups of people to do it with the President involved only in a ceremonial way. I am prepared also to give you a full and complete description of how such an award would be administered.

I would like to say a word about it just now because the proposal has a wrinkle that's different from the Japanese.

We believe that a company that wins the award should be required to provide a report that explains how they changed themselves. They should deserible what they were like before, what they did, and what results they got. That report should be published as an example. It should teach other people how to do likewise.

Just as we give a patent to people who make it clear how they do something, we should give an award for people who make it clear how you change to become first rate.

We have a long list of things you'd have to demonstrate to win the prize. A lot of our list is cribbed from the Deming Prize in Japan. I would be prepared to set up the award process if I can figure out how to get it off the ground. The ASQC has already done much of the spadework.

Mr. BROWN. I would like to have any input that you might make. Have you looked at the draft of the bill that we have before us?

Dr. TRIBUS. Not the bill regarding an award; no, sir.

Mr. BROWN. I would like to have you review that if you would, and offer us any suggestions as to how it might be changed in light of the observations that you've just made, and we will see that you get a copy of that.

Dr. TRIBUS. Thank you, sir.

Mr. RITTER. Mr. Chairman.

Mr. BROWN. Yes, Mr. Ritter.

Mr. RITTER. If you would yield for a question or two.

I'd like to also commend the National Society for Professional Engineers for taking this task on. It's a monumental task. When I listened to the dialog between the chairman and yourself talking about a specific bill, trying to take a small piece of this, which is systemic—you do your best, but it is a much larger problem. It seems that it pervades the educational system, going back to the public schools. It just seems that the rewards are not there in the system, in the corporations, and in the society in general. And we are talking about establishing a national award after somebody who is virtually unknown in the United States of America, outside of a limited circle of individuals and professionals.

And that really—that speaks reams about what our kids learn or don't learn in the public schools. And when I see some of the curriculum projects that have been pushed through the political system to some extent, it is scary.

When I see major education-related institutions in Washington active on subjects which have absolutely nothing to do with the systemic underlying problems that you are presenting here today.

I think NSPE has a role to play here. All these grassroots professional organizations can sit down and talk turkey with the Washington-based organizations that control the directions of our public education. I think that would be very helpful without going into detail. I think it's obvious some of the things that need to be done.

You know, our legislative system—as I am listening to this—we are offering—the legislative was set up on this committee system, so we in this committee are trying to do something about the problem. And the legislative system is like a bicycle wheel—its got all these different spokes. And we are going to use our spoke to get into the hub. But then there's, you know, there's a hundred other spokes that are not even listening.

Now, I've been through some major legislative processes in the last year—the Superfund reauthorization, the acid rain legislation—we're moving great amounts of material around, great amounts of energy are in—I'm saying figuratively, great amounts of energy involved; vast amounts of lawyers, attorneys, professionals. The system is really involved in these subjects that are technically related. But it's interesting that they don't relate one iota to the problem that you are discussing, which is endemic, systemic, yeah.

And it seems to me that when change comes in this country, it doesn't come from up here. We can ask questions which is, I think, a pretty sorry commentary on what we can do because if that's all we can do, it ain't much.

But I think when change comes in the United States, it comes from the grassroots on up. And that's why you're going into this new venture and really approaching the grassroots to all this. I think it's very important.

Should we go home and do a Stan Lundine number in our congressional districts if it's not already being done? Should we be in touch with our NSPE people to try to put something like this at the top burner? Should we start giving prizes at graduation?

I mean, these are the kind of things, I guess, we could do too, to be a part of this process.

Dr. **Tribus**. Well, I think you can. For example, I should like to call your attention to a project in Jackson, MI, now at Jackson Community College called the transformation of America project. It involves a program to train trainers. They have trained trainers in over 100 locations in the United States. They have begun to make contracts, or to develop projects in different States so that the system of community colleges and junior colleges in those States will have available the kinds of educational programs teaching that are required to do what we are talking about here—methods of improvement.

At the same time, our NSPE chapters are going to try to beat the drum and see that people in those communities go to these courses.

I would refer you, for example, to what's happening in Kingsport, TN. I was down there the other day and the mayor, and the chamber of commerce, and the local professional societies, local educational institutions all got together. It was very exciting. They've got 28 projects going in 28 different organizations. I think the fire department, the mayor's office, some retail merchants—there's even an undertaker establishment, but don't ask me what they're doing—are all involved in trying to improve their services to make them less costly, more effective, higher quality.

They expect to have about 100 projects going on a regular basis 7 or 8 months from now when the first group of trainers is trained.

We hope to make things like the project in Kingsport happen in other parts of the United States. I believe the Governor of Iowa, and the Governor of Michigan, have started projects like this. You in Congress can ask what's going on. And if the State you are with isn't doing something, you can ask about why not?

I think the action must come from the grassroots. That's why we're working on that side of it. You can ask questions about whether it's happening in one region or another, publicize where it's happening, where it is good, or where it's bad, where it's indifferent. You can ask why.

One community in Minnesota developed a manifesto.

They said,

> The Japanese are a little island of quality. They have to import everything, add value, and export it, and they are known for quality. There's no reason we can't do the same thing here in our community. We import from the rest of the country what we need. We too can become known as a community of quality.

They have this plan to involve the high schools, the merchants, the chamber of commerce, and the whole community. They believe if they do this, companies will want to come and put their plants there because it will be a place of quality.

We can build that on that spirit.

Mr. Ritter. Mr. Chairman, I've got one other question.

The award system at MIT and Lehigh, my district, and University of Cal-Riverside, the chairman's district, I mean, the award system for engineers is based on, let's face it, it's based on how much research money you can pull in, and publications, certainly. And that's really where it's at in getting tenure and getting recognition, building really empires based on the Federal R&D economy, if you will. And that's very different from a culture of statistically based quality and final products coming off a line, which are different and improved, and continuously improved—this culture of improvement.

I mean, there are certain disciplines that are forming up in the universities now. But I mean, by and large, our——

Dr. Tribus. Yes.

Mr. Ritter [continuing]. What we do here almost rewards a different culture at MIT and elsewhere than what you're talking about. And the more we make available here in Washington, the less the individuals out there have got to deal with that product coming off the line. The new tax bill has some shifts to put more industrial money——

Dr. Tribus. You're identifying a very important apparent, but not real, dichotomy. On the one hand, this country has staked its future on invention and innovation. The Japanese have staked their future on quality and productivity. We invent and they produce.

Now, there are many people who simply haven't studied it very well who think these are opposed—that if you drive for one you will lose the other.

Our universities have been extraordinary resources. MIT has been an extraordinary resource for invention—not for innovation, for invention. The process of innovation is something the Japanese have studied very carefully, and they can take an invention and innovate with it more rapidly than we. And then when they produce it, they can produce it at higher quality and lower cost than we because we do not educate people for those functions.

Mr. RITTER. How do you do both more effectively?

Dr. TRIBUS. Well, it turns out that—this reminds me when I was teaching in the sixties——

Mr. RITTER. Before I go to a press conference on reforming the liability insurance system, we are forming a congressional caucus—you know, it kind of reminds me of how the key role is being played by the attorneys and not by the engineers——

Dr. TRIBUS. Yes.

Mr. RITTER [continuing]. In our corporate setup. I'm sorry.

Dr. TRIBUS. Well, no, you asked how do you do both, and it reminds me when I was teaching in the sixties, the kids used to say, make love, not war. And I always said my generation did both.

It turns out that the company that is well organized for innovation and for quality and productivity, will be very receptive to invention. It is true that the way you manage people who are doing invention is rather different than the way you manage people who are doing the routine things in the implementation of invention. But there thrusts are not opposed. It's just our people have been so bemused by the issues surrounding innovation that they have forgotten that they also have to do something about capturing the fruits of innovation.

They have hoped, for example, in the electronics and computer industry, that if they innovated at a fantastic rate, if every week there was a new product, that nobody would ever get their feet set and innovation would win over quality. The fact that the products coming out the line weren't all that good, would be overlooked by people who wanted them anyway. You recall at the end of World War II we were willing to pay $15 for ballpoint pens when they first came out even though they leaked all over our shirts.

Mr. RITTER. They have really changed the rules of the game, haven't they?

Dr. TRIBUS. That's right.

Mr. RITTER. They really changed the rules of the game.

Well, I am going to get down the hall to my liability insurance reform press conference, but I will be returning to this very excellent hearing.

Mr. BROWN. Thank you very much, Mr. Ritter.

Thank you very much, Dr. Tribus, for your outstanding contribution.

Mr. BROWN. I am going to call our next three witnesses as a panel and ask them all to come up to the table if they will. Mr. Lee

Rivers, who is director of corporate planning for Allied-Signal at Morristown, NJ; Mr. Victor Radcliffe, vice president of National Forge Co. here in Washington, and Mr. William Chenault, executive vice president of Fayette Manufacturing Co., from California.

Gentlemen, we are really very grateful to all of you for being here this morning, and I apologize that more of the committee isn't here but we expect them to be in and out. We are looking for ideas and we are looking forward to your presentation as giving us a broader base of ideas from which we can begin to consider action that would be appropriate will involve us as a member—as the Congress and the Federal Government in this whole problem of developing new strategies for the U.S. economic system to become more competitive.

We would like to start with you, Mr. Rivers, if you don't mind.

STATEMENTS OF LEE W. RIVERS, DIRECTOR, CORPORATE PLANNING, ALLIED-SIGNAL, INC., MORRISTOWN, NJ; VICTOR RADCLIFFE, VICE PRESIDENT, CORPORATE DEVELOPMENT, NATIONAL FORGE CO., WASHINGTON, DC, AND WILLIAM W. CHENAULT, EXECUTIVE VICE PRESIDENT, FAYETTE MANUFACTURING CORP., TRACY, CA

Mr. Rivers. I appreciate the opportunity, Mr. Chairman and members of the subcommittee, to present some of my views on how best to enhance the competitiveness of American industry.

My views are personal and should not be construed as those of my employer, Allied-Signal, Inc., nor those of the Office of Science and Technology Policy, where I currently serve as the industrial research institute fellow.

However, my perspective on the challenges and opportunities we face as a nation in the international competitiveness arena has obviously been influenced by my experiences both within industry and more recently, within Government.

Let me begin with some comments about manufacturing because I believe it to be both crucial and amenable to solution with known or near-term technology.

We simply must develop and install world-class manufacturing operations in this country. The factory of the future must rapidly become the accepted American way to manufacture. The manufacturing facility which can be used to build a wide variety of products, switching rapidly from one product to another, and using computer-aided design and computer-operated robots for assembly, must be put in place by a broad spectrum of American industry. General Motors, General Electric, and IBM can lead the way, but they must quickly be followed by the 100,000 small job shops that form the backbone of American manufacturing.

Computer—aided—integrated manufacturing derives its principal benefit from vastly improved quality and lowered total manufacturing cost. Since the typical direct-labor content of U.S.-produced goods is in the range of 10 to 15 percent of total costs, investment in computer-integrated manufacturing facilities often would not be justified economically even if it completely eliminated all direct labor costs.

What CIM does is much more than lower direct labor cost. It automates the flow of information throughout the factory which eliminates mny of the costs associated with indirect labor, middle management, and other overhead in addition to lowering direct labor costs. Now, those other costs typically represent 45 percent of total manufacturing costs.

With CIM you have significantly lowered your total costs, you produce a very uniform high-quality product, and you have a manufacturing facility with a break-even point as low as 25 to 30 percent of capacity as opposed to today's conventional plants that often have break-even points requiring 65 percent or higher plant loadings.

Mr. **Brown**. Mr. Rivers, if I may interrupt you, just to clarify that point. Is that due to the factor of the overhead costs that you have——

Mr. **Rivers**. Yes. If you recall the earlier testimony you heard made reference to the fact and perhaps it was in the discussion period, the fact that the high overheads continue when the loadings come down. By having mastery of the information flow throughout the factory you have significantly lowered your overhead costs, your middle management costs. It's not an attack on direct labor. It's an attack on the total cost structure, and that's the key, really, to the advantages that are achieved from a computer integrated so-called factory of the future.

Mr. **Brown**. I apologize for interrupting you.

Mr. **Rivers**. Americans must work together to shorten the timespan for our manufacturing sector to complete this metamorphosis from the conventional factory as we have known it since the beginning of the industrial revolution to the factory of the future.

The future for manufacturing is now. We must work together as industry, Government, labor, and academe to remove any and all barriers to the expeditious development and implementation of this new science of manufacturing.

The barriers I see include a disproportionately high cost of capital—certainly when compared to that of our principal international competitor, Japan; an American management focus that is short-term oriented and thinks primarily in terms of return on investment when considering manufacturing facility installations rather than long-term strategic positioning of the business; an attitude of labor that productivity improvement is a management euphemism for job elimination; a failure on the part of all elements of our society to aggressively address the need to retrain displaced workers; and perhaps most important, the general lack of appreciation on the part of the public of the serious nature of our manufacturing sector's shortcomings.

Those barriers to progress in putting modern manufacturing facilities in place throughout the United States must be removed. To accomplish this, effective cooperation between industry, Government, labor, academe, and the investment community is required. Bipartisan leadership involving the Congress and the administration is required to catalyze this type of cooperation.

We need to encourage savings and investment throughout our society and remove the bias in our tax policy that favors consumption. One way to explore that would be to engage in a national debate concerning the merits of a value-added tax.

If the pressing need in the Nation today is to revitalize our manufacturing base, the pressing need of tomorrow will be to become masters of the flow of information. Those who control the conversion of data into useful information will be able to add significant value to their organization, whether it be industrial or Government. Recall that the truly significant savings that result from computer-integrated manufacturing come from automating the flow of information throughout the factory.

It stands to reason that the individual or organization that adds the most value to output will receive the most reward. Information management and information engineering will be the keys to our standard of living in the very near future.

We must develop the skills to transport, manipulate, search, arrange, and present data as useful information thereby increasing our individual and collective know-how and knowledge.

If we don't take the lead in the management of information, our international competitors will outstrip us in adding value to the world's goods and services. We will become the metal benders and assemblers while the Japanese build the high value-added engines and drive trains that power the world's automobiles. Those companies and nations who control information and use it wisely will be rewarded; and those who don't, will be relegated to a lower standard of living—and it's that simple.

This brings me to the human resource issue. One of our Nation's great strengths has been its inventive people, spurred on and encouraged by a free society. Science and technology, more so than ever before in history, will be the drivers of the New World economy.

The United States no longer controls the pace at which science is converted into technology—the technology which produces the world's goods and services. This very hearing bears testimony to your concern about that fact.

We need to address a series of human resource issues in the science and technology area that begin with elementary school education. The bulk of our children are not exposed to good science teaching in the early, formative stages of their education. Unfortunately, this situation continues throughout their secondary education. The result is that many potential scientists and engineers are lost to those professions because they are never exposed to the excitement and enthusiasm of even one good science teacher throughout the first 12 years of their education. I assure you that many of our international competitors do not allow that to happen to their youth.

The poor physical condition of many of the science and technology facilities at American universities and the antiquated scientific instrumentation being used on many of our campuses today are facts well-known to this committee.

We need to develop specific implementation plans to expedite the recommendations contained in the Report of the White House Science Council's Panel on the Health of U.S. Colleges and Universities—the Packard-Bromley report.

Turning to our Federal laboratories, it is a tragedy that we have not found an effective way to utilize the one-sixth of our Nation's scientists and engineers who work in those Federal laboratories more constructively to aid in our battle to maintain, no less enhance, our position as a leading supplier of high value-added goods and services to the work marketplace.

Pending legislation which would disseminate to the directors of those laboratories greater decisionmaking authority to negotiate working relationships with private industry and reward individual inventors with a share of future royalty streams deserves strong support and rapid implementation.

Permit me to close on a note of successful cooperation which is worthy of further emulation. I refer to the National Science Foundation's Engineering Research Centers. This program which unites academe, indusry, and the Federal Government in an effective union to further the rapid development of needed engineering advances should be expanded to include multidisciplinary centers of excellence in the sciences.

Today, the United States may be preeminent in the discovery of new science. Tomorrow, we may find that just as we have lost the lead in moving science into the marketplace faster than some of our international competitors, we may lose the lead in the discovery process as well. Let us take bold steps to assure that does not happen.

We must move faster than our international competitors on all fronts. To do that we need to diminish the adversarial attitude that exists between major segments of our society and foster a much stronger spirit of cooperation.

If we can get our act together, there is no international competitor that can take market share from us; there is no international competitor that can out-manufacture us; or manage the flow of information better; or educate their youth; or retrain their workers; or create new knowledge better than we can do it—if we can get our act together.

Mr. Chairman and members of the subcommittee, I applaud your efforts to bring to focus the issues you have before you and encourage you to take take bold steps to lead an American people who do not want to see their high standard of living slip away.

That concludes my remarks, Mr. Chairman. I look forward to our discussion.

[The prepared statement of Mr. Rivers follows:]

TESTIMONY OF LEE W. RIVERS
DIRECTOR, CORPORATE PLANNING
ALLIED-SIGNAL, INC.
and
INDUSTRIAL RESEARCH INSTITUTE FELLOW
OFFICE OF SCIENCE AND TECHNOLOGY POLICY
EXECUTIVE OFFICE OF THE PRESIDENT
before
SCIENCE AND TECHNOLOGY COMMITTEE
SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY
UNITED STATES HOUSE OF REPRESENTATIVES

Hearing on Strategies for Exploiting American Inventiveness
in the World Marketplace

June 24, 1986

LEE W. RIVERS

Mr. Rivers is a Director, Corporate Planning, for Allied-Signal, Inc., a large manufacturing firm whose principle businesses involve aerospace, automative, electronics and engineered materials. Throughout his thirty-five year industrial career he has served Allied-Signal and its predecessor companies in a variety of capacities involving research and development management, new product and process introductions, technology licensing (domestic and foreign), and general management. He is currently on loan to the Federal Government serving as the Industrial Research Institute Fellow in the Office of Science and Technology Policy.

He was elected to a three-year term as a director of the Industrial Research Institute (IRI) in May of 1985. He served as chairman of IRI's Research-on-Research Committee during the time that Committee structured and completed an extensive study on industrial research productivity. He has participated in two joint study missions conducted by IRI and their European counterpart, the European Industrial Research Management Association (EIRMA). During these study missions, comprehensive visits were made to ten major European industrial research facilities in the United Kingdom, the Netherlands, France, West Germany and Switzerland. The visits included such major collaborative efforts as the Ariane rocket fabrication facility, Superphenix, a 1200-mw fast breeder reactor power plant, and CERN, Europe's high energy physics laboratory.

Mr. Rivers is past president of the Commercial Development Association (cda) a professional society with 800 members who specialize in bringing new innovations to the marketplace. In October of 1985, he led a cda delegation to China for two weeks of technical exchange meetings with national and provincial government officials.

His undergraduate study was at the University of Illinois and New York University, where he received a Bachelor's degree in Chemical Engineering. He has a Master's degree in Chemical Engineering from the University of Delaware and is a registered professional engineer in the state of Louisiana.

TESTIMONY OF MR. LEE W. RIVERS
BEFORE THE SCIENCE AND TECHNOLOGY COMMITTEE

SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY

June 24, 1986

I appreciate the opportunity to meet with you Mr. Chairman and members of the Subcommittee to present some of my views on how best to enhance the competitiveness of American industry.

My views are personal and should not be construed as those of my employer, Allied-Signal, Inc., nor those of the Office of Science and Technology Policy where I currently serve as the Industrial Research Institute Fellow. However, my perspective on the challenges and opportunities we face as a nation in the international competitiveness arena has obviously been influenced by my experiences both within industry and, more recently, within government.

Let me begin with some comments about manufacturing because I believe it to be both crucial and amenable to solution with known or near-term technology.

We must develop and install world-class manufacturing operations in this country. The factory of the future must rapidly become the accepted American way to manufacture. The manufacturing facility which can be used to build a wide variety of products, switching rapidly from one product to another, and using computer-aided design and computer-operated robots for assembly must be put in place by a broad spectrum of American industry. General Motors, General Electric, and IBM can lead the way, but they must be quickly followed by the 100,000 small job shops that form the backbone of American manufacturing.

Computer integrated manufacturing derives its principle benefit from vastly improved quality and lowered total manufacturing cost. Since the typical direct-labor content of U.S. produced goods is in the range of 10 to 15% of total costs, investment in computer integrated manufacturing facilities often would not be justified economically even if it completely eliminated all direct-labor costs. What CIM does is much more than lower the direct labor cost. It automates the flow of information throughout the factory which eliminates many of the costs associated with indirect labor, middle management and other overhead in addition to lowering direct labor costs. Those "other" costs typically represent 45% of total manufacturing costs. With CIM you have significantly lowered your total costs, you produce a very uniform high-quality product and you have a manufacturing facility with a breakeven point as low as 25 to 30% of capacity as opposed to today's conventional plants that often have breakeven points requiring 65% or higher plant loadings.

Americans must work together to shorten the time span for our manufacturing sector to complete this metamorphosis from the conventional factory as we have known it since the beginning of the industrial revolution to the factory of the future. The future for manufacturing is now. We must work together as industry, government, labor, and academe to remove any and all barriers to the expeditious development and implementation of this new science of manufacturing.

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We need to encourage savings and investment throughout our society and remove the bias in our tax policy that favors consumption. One way to explore that would be to engage in a national debate concerning the merits of a value-added tax (VAT).

If the pressing need in this nation today is to revitalize our manufacturing base, the pressing need of tomorrow will be to become masters of the flow of information. Those who control the conversion of data into useful information will be able to add significant value to their organization whether it be industrial or government. Recall that the truly significant savings that result from computer integrated manufacturing come from automating the flow of information throughout the factory. It stands to reason that the individual or organization that adds the most value to output will receive the most reward. Information management and information engineering will be the keys to our standard of living in the very near future. We must develop the skills to transport, manipulate, search, arrange, and present data as useful information thereby increasing our individual and collective knowhow and knowledge. If we don't take the lead in the management of information, our international competitors will outstrip us in adding value to the world's goods and services. We will become the metal benders and assemblers while the Japanese build the high value-added engines and drivetrains that power the world's automobiles. Those companies and nations who control information and use it wisely will be rewarded; those who don't, will be relegated to a lower standard of living--it's that simple.

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Mr. Chairman and members of the Subcommittee, I applaud your efforts to bring to focus the issues you have before you and encourage you to take bold steps to lead an American people who do not want to see their high standard of living slip away.

That concludes my remarks, Mr. Chairman. I'd be pleased to respond to your questions.

Mr. **Brown**. Thank you very much, Mr. Rivers.

Let us hear from Mr. Radcliffe now from the National Forge Co.

Mr. **Radcliffe**. Mr. Chairman, I would like to take a slightly different tack from either of the preceding speakers with whom I find a lot in common. But if I might begin on a personal note, it gives me considerable pleasure to sit once again in a committee which is being chaired by Congressman Brown. It is quite some years ago since I did that when I was then spending some time, as the previous speaker, on leave from university in the Federal Government.

But that period of time does go back a long way. In preparing for this morning's presentation, Mr. Chairman, I am afraid, because the kind invitation to speak before your committee came a little late, I have a rather crumpled draft here which is not in fit form to put in front of you at the moment. But if you so wish, I would be delighted to deliver it to your staff by tomorrow at the very latest.

Mr. **Brown**. That would be perfectly acceptable, Mr. Radcliffe. And we would appreciate your doing that so that we will have the best possible record of your remarks.

Mr. **Radcliffe**. Thank you.

Going back a little in history again in thinking about what might be helpful for me to say to the committee today, and flicking through my papers, I—fell out of the package a—a paper which I gave to the National Economies Club quite sometime ago—in fact, in 1976—and it was called Technology in U.S. Economic Policy, Domestic and International Implications—a fine sounding title.

The thing that troubled me, Mr. Chairman, is that—and I will just quote a couple of passages from this—is that we still seem to be struggling with the same sort of issues that you have been fighting for for a decade or more.

For example, the opening paragraph, in the present period there are contentions that Federal Government support for commercially oriented research and development is essential to ensure the continued technological vigor necessary for the health in international competitiveness or the national economy. Yet, do we really know enough to guide the formulation of relevant technology policies?

And then a later paragraph, or sentence, which is preceding, looked at the—what other countries are doing, a favorite game, which I think has had some influence on your latest legislation. There are obvious reasons why it's unwise for the United States to treat such other country experiences as lessons to be emulated. However, they do provide warnings together with some guidelines that are coordinated U.S. perception of how best to manage the relationship between technology and economic policy is desirable.

I think Myron Tribus spoke very effectively to that today. He was not saying do as the Japanese do. I think he was saying we can do as Americans do, but we can learn something from the Japanese, both their good points and their bad points. And I would certainly support what he had to say.

Well, let me turn now, Mr. Chairman, to make a brief connection to what has, I think, been a very important theme of the committee over a long period of time—and I have indeed followed both the topic and the committee over several Congresses.

And the basic issue seems to have been, and still be, whether or not, and how, there might be a stronger and more direct Government role in the development and use of technology by American industry, and that has persisted as the committee's central concern and I believe its main driving force for exploring new legislation. And I use that word deliberately.

Now, I think discussions inside and out the committee have generally agreed on the need for Federal Government to encourage technological innovation in civilian industry. Unfortunately, they have generally disagreed on means. Even some indirect measures, for example, tax credits for industrial R&D, have been criticized recently, quite generally, as having proven insufficient in practice. And currently we have both the House and Senate versions of the ongoing tax reform efforts which have clearly turned away from tax incentives as a stimulus to investment in capital equipment even though such investment has long been seen by this committee as an essential part of technological innovation.

There are a few encouraging items of progress in other direct—indirect areas. Antitrust clarification is certainly accelerating cooperative research among firms in a given industry and clearly increased if a little uncertain support has emerged in the present Congress for engineering education and research, including some collaborative work with industry in manufacturing technologies.

But I think what remains as the main bone of contention is the question of direct measures, and that clearly is especially the case on the issue of desirability or otherwise of any new Federal agency intended to provide a focus for Government policy and more direct involvement and attempts to improve industrial innovation and competitiveness.

Now, in all of these discussions my belief is that perhaps the only area of broad consensus has been that it seems to be desirable for Government in its unique capacity to undertake or support studies of the U.S. competitive position in specific technologies or industries.

Now, until recently there had been very few such studies, mostly they were broad national comparisons. Yet, in fact it's precisely that type of understanding which is most likely, I suggest, to raise the right questions. It could also point to Government roles that might be more effective in stabilizing and improving the long-term competitive position of U.S. industry and in gaining the wider support.

I'd like very briefly, Mr. Chairman, before I close, to point up three specific points which I have drawn from this wide variety of both Government and nongovernment, but Government-supported, studies along the lines I just described. The—the reason I'd like to emphasize that is that I believe they bear directly on the committee's central concern that I defined earlier. And it also may suggest a somewhat different emphasis for prospective legislation.

The first point is that the widespread belief that the United States is deindustrializing compared with other advanced countries really appears unfounded. Let me explain that. The U.S. manufacturing sector has really not changed substantially as a share of the real gross national product over the past 30 years. It was 24½ percent in 1950, 25.9 percent in 1973, and 23.9 percent in 1984. In absolute terms, then, its continued to grow with gross national product.

What has declined over more than two decades in all industrialized countries has been manufacturing share of value-added in current prices. Now, that's occurred due to higher rates of increase in productivity and manufacturing that slowed price increases compared with the service sector and to consumer spending more of their growing income in services rather than on goods.

Now, there have also been consistent declines in manufacturing share of employment. It is the declining jobs and its concentration in specific parts of the country that I think justifies the widespread public concern in the Congress and elsewhere. Now, that problem has been exacerbated during the present era of a very remarkable increase in real capital expenditure in the United States.

I know the Reagan administration has been particularly proud of this. Whether that's justified or not I'm not sure, but nevertheless its happened. We are in a position where the level of capital expenditures following the latest recession has reached the highest real levels the country has ever seen.

Yet, you look around the country and what do you see? You find that there are patches of very large patches of regions which have been, I think, devastated, is not too harsh a word to use. And the reasons for that I discuss in my longer paper but I wanted to emphasize that it is important, (a) to recognize that American manufacturing is growing in actuality; that nevertheless, it's undergoing radical changes in mix, and as a result of these changes in mix there are serious important changes in the distribution of employment. I would suggest that's one question that this committee should give some attention to because I think it's in a position to get some other attention given to it.

The second point is that a broad array of factors have been shown to influence industry's international competitiveness. And the relevant importance of these factors can differ widely from industry to industry. Now, this is a complex area and I think it simplifies things, for me, anyway, to try to think of competitiveness as a long array of things that Congress and others will spit out at the slightest opportunity in three broad categories.

The first of these are the classic concepts of comparative advantage, energy, other material imports, labor, capital equipment and product and manufacturing technologies.

Second, macroeconomic factors, interest rates, inflation rates, and exchange rates, which are really beyond the control of the individual firm or industry.

And, third, a set of factors involving Government intervention in international trade which the United States exercises as well as other countries through tariff and nontariff barriers, direct and indirect subsidies.

Now, for the U.S. technology, especially product, but hitherto rather less for manufacturing technologies, which point attention has been drawn earlier, these, along with the quality of the workforce have provided comparative advantage for many industries in the United States. Conversely, it's well known that capital costs, labor costs, and in recent years, exchange rates, all impose severe comparative disadvantage for the United States.

U.S. trade policies and international trade laws, especially to the extent that successive U.S. administrations, not just this one, have been less than successful in enforcing them, have generally been a comparative disadvantage.

It's clear that in any given industry a technological innovation that overcomes comparative disadvantage doesn't necessarily result in competitive advantage internationally. That's going to depend on the extent to which the industry in question is affected by the factors in the second and third categories, few of which can be redressed through technology. Yet, those are the factors which known for a given industry, I think the work of this committee could point up elsewhere in the Congress even though it doesn't come under the committee's jurisdiction.

My final point—point 3—is that one of America's greatest successes, the achievement of a high average standard of living, presents one of its greatest challenges to technology. It's very clear that a national objective that has been central and unchallenged in American society has been to insure the opportunity for improvements and individual well-being, which in practice translates into real income levels and increases in them.

It has become apparent with the advent of the global market and its attendant overall advantages for the American economy and national security that beginning in the early 1970's, unit labor costs have exceeded those of many of our trading partners by a considerable margin.

The absolute level of productivity in the country, while still among the highest, is no longer sufficient in many manufacturing industries to offset the high wage rates.

The President's Commission on Industrial Competitiveness in its very aptly named report, Global Competition: A New Reality, which has been discussed in this committee, recognized the desire to maintain our standard of living in these new circumstances. They concluded, however, that it is a competitive disadvantage that Americans will doubtless choose to keep. Unfortunately, the Commission offered us little in the way of constructive direction by which we might be able to do so.

So in summary, Mr. Chairman, I wanted to personally endorse, and I'm speaking personally, the efforts of the committee—the long efforts on their central concern. But I'd like to respectfully suggest that some of the questions to which the legislation, both the current and previous, has been seeking to give an answer—may not be the right ones. I've suggested three points dealing with the specifics of U.S. international competitive experience that I believe do suggest, or point to, some of the right questions, in particular, relating technology to the other competitive factors and raising them elsewhere in the Congress where it's appropriate.

And what are the answers to these questions? Well, I'm not leaving that entirely to the committee, although I will leave most of it to the committee.

I did want to mention in closing that in August, another professional society umbrella analogous to the one that Myron Tribus spoke to, this one the Federation of Material Societies, has organized a meeting under the title of "Advanced Manufacturing Materials and International Competitiveness," to which it is trying to bring together both technical and manufacturing people from the materials and the manufacturing world, the world of computer integrated manufacturing, and advanced manufacturing that the previous speaker spoke to, in the hope that against the context of an analysis which is to be presented of a selection of American industries which have been reviewed for their competitive capabilities and shortcomings by the International Trade Commission, by the OTA on the Hill, by the Department of Commerce's competitive assessments, and by the National Research Council of the National Academy.

We are trying to bring all that information and understanding together so that we can make a more objective appraisal of where and how these two types of technology, which I think are key, can both separately and in an interactive way, contribute better in the future to enhancing the position of those industries.

And I would be delighted, Mr. Chairman, to submit to the committee privately or in any other way you wish after the conference some of the findings that come from it.

Thank you.

Mr. BROWN. Thank you very much, Mr. Radcliffe.

Mr. Chenault.

Mr. CHENAULT. Yes, sir.

Mr. BROWN. Did I pronounce your name correctly?

Mr. CHENAULT. Chenault, yes, sir.

Mr. BROWN. Chenault.

Mr. CHENAULT. After these treatises——

Mr. BROWN. Could you bring the mike a little closer to you, please.

Mr. CHENAULT. I think I—is this better?

Mr. BROWN. That's better.

Mr. CHENAULT. After these macro level treatises—I hope this isn't too dramatic a shift to the microlevel. I believe Fayette's manufacturing experience over the last 5 years—the first 5 years of our existence has brought us into touch with many of the factors of policy that people talk about when they talk about the problem the committee is addressing.

We formed the company in 1981 because of the alternative energy subsidies, the tax shelters, and so forth, gave us hope of reaching commercial viability with our wind energy technology. We use those proceeds to bring a second technology to the verge of commercialization, that is, the so-called Kalina Cycle which increases the output of a steam turbine by approximately 20 to 25 percent.

And now for about the last year, we have been trying to export our products to several companies—several countries—overseas. Our growth under the energy credits was substantial. In Inc. magazine's list last December, made us—rated us the fifth fastest growing company in the States, with sales of about $63 million, employment peak of some 260 jobs, and numerous suppliers and subcontractors in several depressed areas of western Pennsylvania as well as California, and several other States.

This growth and job formation came at a time when the Fortune 500 were reducing jobs, and some of the large smokestack industries were laying off workers, some of whom we hired. And in some cases, buying oil companies, and otherwise departing from the—the technology they—they had majored in, as it were.

Along with the growth we have also experienced some of the disadvantages of subsidies—higher sales costs, unsteady market and cash-flow, and above all, the abruptness, of course, with which certain of the credits have ended.

With the Kalina Cycle we have experienced some obstacles in the regulatory process where delays have been translated into critical financial and investment problems for us at various times. In frustration over one of those delays, in fact, we had—we felt we needed to form a non-U.S. subsidiary to explore investor interest and start up subsidies available elsewhere.

Another domestic problem, and I'm sure everyone complains about this, has been the IRS zeal in—in labeling subsidies as evils across the board. We have tried to convince them that they should spend more of their resources on first understanding these new technologies that are the subject of various subsidy legislation.

Our overseas marketing efforts—they are only beginning—have raised questions which may be typical for smaller companies with new technologies. Our legal costs have been very high and a large part of them relate to learning the other country's system rather than a specific contract.

Foreign competitors appear to be supported more directly and strongly by their governments, including lower interest financing on exports. When I was in India a couple of weeks ago, they told me quickly that our competitors from one European country had had their entry arranged by the royal family.

I don't know what we can do to give more centralized thrust or backing to our business, and especially the smaller businesses that I think represent the greatest productivity in the country. But, again, it's a question and a problem, one that I won't try to answer.

Our advisers at one point considered working through a foreign subsidiary because that country had a favorable trade treaty with the country we were were dealing with. And I found that the United States had been, since 1962, I believe, trying to negotiate a bilateral trade treaty with that same country. I can't pass judgment on the whys and so forth of that—of that not being done. But it was ironic, I thought, that we were being asked to go through a European country to deal with an Asian country because of the better tax arrangements between Europe and Asia.

Overall, I believe we do need to subsidize, to encourage risk capital formation. I think level playing fields have been talked about a lot but they are easily tilted by very large companies who may dominate particular sectors of a technology and in some cases, forestall the development of new products.

I think these subsidies from our experience should be more predictable. We have had a considerable problem with reform over the last, really, about 5 years, because it has often meant uncertainty about particular credits or arrangements that we could operate under, and including such fundamentals as the investment tax credit, which I think is a mistake to wipe out.

We've seen some good experience, I think, with research and development tax credits. We've used them ourselves several times to bring new products up to the level that they could begin to compete.

I think the SBIR program is in some cases working very well. In my own dealings with Penn State University, although we haven't used the program, but I met many of the faculty up there to talk about it, and they are out beating the bushes to find the smaller companies and the new ideas that can link up with that university setting. And if that's typical around the country, then I would say that program has a chance of encouraging innovation and the application of technology effectively.

And as I mentioned, when such subsidies are used, a problem does arise when they terminate quickly and abruptly. At least if it's a large subsidy, I think probably the energy credits were too large. I think they brought out marginal efforts that probably weren't justified in some cases. But when they end abruptly it is very hard for new and smaller companies to deal with that. I agree with sunsetting everything, but I think it should be phased over a 2, 3, 4 year period. And with business—especially small business, doesn't adjust to an all or nothing type market situation very well. And especially the newer ones that tend to be vulnerable.

Well, that's a summary of the written remarks that I've turned in, unless there are any questions.

[The statement of Mr. Chenault follows:]

WILLIAM W. CHENAULT is Executive Vice President of Fayette Manufacturing Corporation. The Company was formed in January 1981 to manufacture and operate electricity-generating wind turbines and to develop the Kalina Cycle technology, which promises 20% to 25% increases in the output of steam-driven turbines. A fully integrated designer, manufacturer, and operator of wind generators located on its Tracy, California, wind farms, Fayette was listed in Inc. Magazine's December 1985 issue as the fifth fastest growing private company in the United States, with some $170 million in sales over its first five years. Mr. Chenault's offices are in McLean, Virginia, where since 1966 he has been a social scientist, officer, and eventually the principal owner of Human Sciences Research, Inc. His HSR work revolved around consulting contracts with Federal agencies, including management, administration, and technical assistance studies for the Public Health Service, Environmental Protection Agency, and numerous other offices. During the Three Mile Island incident, his team observed and analyzed the "crash" evacuation planning effort in state and local jurisdictions.

Testimony of William W. Chenault
Executive Vice President
Fayette Manufacturing Corporation

Mr. Chairman and Members of the Committee. I appreciate this opportunity to describe the development of our new company over its first five years and hope our particular experiences, both good and bad, will help suggest how the government could encourage and foster the technological initiatives which we feel are the best way to restore this country's preeminence both in applied technology and world trade.

I confess to being well outside my usual bailiwick but hope the Committee will find it useful if I first describe Fayette's two principal areas of endeavor and then list a few suggestions for exploration by those more versed in the ins and outs of government policy -- its intended effects, side effects, etc.

In early 1981, Fayette's founders, and particularly John Eckland who formed the company, had access to two technologies: (1) a particular model of wind electric generator, and (2) patents for a revolutionary thermodynamic process called the Kalina Cycle. We thought the wind technology was near to commercial viability but knew the Kalina process would require a major and expensive development effort. Our decision to go ahead was prompted by a subsidy, or combination of subsidies, affecting alternative energy. I refer to the 1978 PURPA regulations requiring utilities to purchase alternative energy, the investment tax credit and rapid (ACRS) depreciation, and particularly the substantial Federal and California energy tax credits which had recently been enacted. Our decision to proceed followed from our belief that the energy tax shelter would generage sufficient cash flow to (1) bring the wind turbines up to commercial viability while (2) providing sufficient spin-off resources to support substantial additional research, analyses, overseas patenting, and other steps required to apply the Kalina Technology. So we started because of a specific set of energy subsidies.

Our experience with wind technology highlights both the advantages and disadvantages of a tax-shelter subsidy. On the positive side, our sales increased rapidly, from about $2 million in calendar 1981 to a peak of $63 million in 1984 and roughly $40 million in 1985, when we had to be very careful not to be stuck with heavy inventory if, as projected, the Federal energy credit disappeared last December 31. This rapid growth in sales and jobs created, to a peak of about 260 people plus numerous subcontractors and suppliers in depressed areas of Western Pennsylvania as well as California, qualified us for the fifth highest slot on Inc. Magazine's December 1985 list of America's fastest growing private companies.

The cash flow thus generated went at least part way to meeting our projected developmental costs for wind technology and the Kalina Cycle. We developed some seven successive generations or models of our wind generator, and spun off about $4 million for in-house research, legal work, university studies, and other engineering work on the Kalina Cycle. It was an exciting, high-morale period of dynamic growth and measurable technological advancement. Interspersed with these plusses were a few crisis points when the most certain of our latest enhancements would blow up in our faces, but the overall momentum was good and the midnight oil was usually rewarded by a new round of product improvements.

There were also disadvantages associated with this rapid, subsidized development. The tax shelter supported a market for our new product, with the principal economic advantages going to our investors. Because the subsidy was short-lived, some substantial portion of the five-year subsidy period was spent in reaching and educating the investor market. And because only a few shelter-sales organizations had reasonably ready access to appropriate investor populations, the sales fees ate up a disproportionate amount of the income generated. Criticism of the energy shelters (which seemed to be inversely proportional to the current price of an exhaustible oil resource) and the resulting debates in legislative bodies abetted the sharp swings in marketability which in turn made it difficult for a small, new company to adjust its production and research efforts to the realities of an erratic income stream. The short-term nature of this substantial subsidy essentially asked us to create a new, commercially viable technology in less than five years -- as opposed, say, to the 12-15 year development process often attributed to a single weapons system.

I'll shift now to the Kalina Cycle -- an essentially "higher tech" innovation requiring vastly larger doses of investment capital for a single prototype -- on the order of $8-10 million for a first plant as opposed to $100,000 or so for a new model wind generator. Fayette's development work, as I've indicated, has included what are, for us, very substantial outlays for research, a computer simulation of the process, and detailed engineering drawings of the prototype plant. As one part of this approach, we requested nearly two years ago that the first plant be certified by the Federal Energy Regulatory Commission as a Qualifying Facility under PURPA -- a certification which would facilitate our negotiations with utilities and potential investors. I am now told that this application will be formally considered by the Commission this week. That delay has been costly for us, particularly when you consider how the energy investment climate has changed over the past year or so. I focus on this aspect only to suggest how intertwined may be the factors of regulation and other government policies such as the emphasis on energy development. We have no information as to why this certification process has taken so long -- I can only assume that some aspect of the application required such lengthy study and analysis -- but it does point up the fact that even a seemingly straightforward regulatory determination may stall an innovation at a time when such delays can pose critical survival issues to a new or small company which has invested heavily in a new technology. One result of this delay was to prompt us to form a Canadian subsidiary in order to explore that investment marketplace and the possibly substantial direct subsidies available if we build this prototype plant across the border. (In fairness, I should point out that California has recently agreed to provide loan support for a portion of the first plant.)

Another area in which government agencies do not always share the spirit of technology-development policy has been taxation. As a leading alternative energy manufacturer, Fayette has of course attracted attention from Internal Revenue Service tax-shelter investigators. I think I can appreciate the difficulty of reconciling the tax man's job with the sometimes uncertain course and evolution of a new business wrestling with a new technology -- in this case, I'm referring again to the wind farms. But I also believe that some of the resources and the sheer time devoted to prowling for tax abuses could better be spent in educating the Service about the developing technologies and the circumstances of doing business in them. We have spent a great deal of money trying to learn the rules around the shelter which has benefitted us, and we more than anyone would like to differentiate the bad apples from the legitimate enterprises which are indeed using this subsidy to further the national policy which prompts it.

Finally, I come to the newest area of Fayette's endeavor, which is the overseas marketing of the wind energy and Kalina technologies. This process has received our attention for the past year and of course it is causing us to learn yet another new field in order to pursue our chosen technological path. Again, the cost of learning has been high for a small business. I'll mention only a few anecdotes to characterize our partially formed overview of foreign marketing and collaborations. (1) After reaching a tentative agreement with an overseas partner, it required some $50,000 in legal and accounting fees to compare the two tax/regulatory/currency exchange systems and determine the correct form that the arrangement should take; (2) we were preceded to one country by four foreign competitors, whose entree was supported by a visit from the royal family; (3) those same competitors are supported by their government's subsidy in the form of 4-5% export financing, evidently for periods up to 10 years; (4) our advisors seriously considered marketing via a European subsidiary, because several EC countries have tax treaties with the nation in question, whereas the United States and that country have apparently been negotiating about a potential treaty since the early 1960's; (5) in the area of services, at least, I'm being told that I can only partially offset the effects of foreign taxes in our own tax return. From these kinds of experiences, I'm wondering why my country cannot represent business forcefully, conclude reasonable bi-lateral trade agreements, and provide competitive subsidies in the trade area.

I conclude with a few general observations suggested by our, at least preliminary, reading of what we've encountered during our brief, somewhat tumultuous span of business years. I think it is generally accepted that America's ~~smaller~~ businesses have been generating jobs, often while many of the Fortune 500 giants have been pruning or exporting them. If America is to be anything other than a market for everyone else's technology, we -- you--will probably find answers in the encouragement of smaller firms developing and applying new technology. Bigness, *per se*, may in fact be an important source of our technological problems. Indeed, one of the greatest benefits of PURPA and the cogeneration movement may have been to stimulate more up-to-date, competitive thinking in some of the sleeping giants of the utility industry.

I have no ~~sure~~ answers concerning the "how to" part of this policy question. I think all agree that you must consider how to encourage risk-taking and risk capital formation. I would opt for across-the-board encouragements like the investment tax credit, and for tax credits in a few areas where consensus might be found on the national interest. I would emphasize continuity and predictability. The energy credit may have been a little larger than was needed, encouraging too-marginal efforts, but its principal business drawbacks were its short time span and especially its precipitous end. Few new, small industries can accommodate such sudden change or an all-or-nothing market. Any such subsidies should be scheduled to "sunset" gradually over several years. In the foreign trade area, we are only just learning, but I wonder whether some substantial portion of the legal, tax, and currency-exchange issues couldn't be presented in some more standardized form to those of us just entering the arena. Here, as in domestic business, my bias is naturally with the newer and smaller companies -- those who can't afford to hold back an innovation which may compete with an existing line or industry. Unfortunately, we also can't afford the overseas offices and multi-national involvements which facilitate the operations of our larger, established competitors.

Mr. **Brown**. Thank you very much, Mr. Chenault. You have some excellent suggestions which we should pay much more attention to. Now, the business of sunsetting particular programs in the government achieved a wide respectability, or a wide acceptance at one point. The question of the impact of sudden sunsetting, I don't think was ever really considered. And your suggestions that there be a more gradual phase-out of some of these programs, particularly the investment tax credit type of things, may be one way to get much more value out of some of these programs than we have in the past.

Let me start a little discussion on some of the points that you mentioned here—all of you have mentioned.

Mr. Rivers, I've been concerned that there have been some excellent studies made by this administration, the ones dealing with productivity, the one that you referred to having to do with the health of our university research structure.

I sometimes wonder why more hasn't happened as a result of these studies. Has your position in the OSTP given you any insight as to why we haven't been able to do a little more? And let me ask you specifically. You mentioned making some improvements in the Federal laboratory system to facilitate improved cooperation with private industry and so forth.

We had some legislation moving in that direction but it does not seem to have received a great deal of attention. I'm not sure whether the administration's even supporting it or not. And that bothers me a little bit because I think we should be working cooperatively with the administration just as the lab should be working with the private industry sector to achieve some of these goals.

Mr. **Rivers**. Let me start with your first observation and say that I share your frustration and I so testified before the joint hearing that the Science and Technology Committee held with the Foreign Affairs Committee a month or so ago.

I think we have an excellent repertoire of recommendations that have been prepared by this administration and, unfortunately, for a series of reasons, many of them have not been implemented. Although there is progress being made on a number of fronts, not the least of which is the one you referred to specifically of bringing the Federal labs more into the fray. And I enjoyed the comment that was made before about perhaps thinking of it in terms of a war with Japan. That may be harsh terminology but I think Japan is just symbolic of the type of fierce international competition that we are going to see as a result of technology transfer and movement all over the world.

And I spoke to the information era that we are entering and, of course, the thing that the information era does is to rapidly make useful data in the form of knowledge available worldwide.

The administration is reviewing both pieces of legislation that deal with the issue of bringing the Federal laboratories into the mainstream of that fray.

I did mention in my testimony today that I favor dissemination of authority from Washington out into the laboratories. In fact, that's the general thrust that I had behind all of the observations I've made in the 8 months that I've had the privilege of working in your town.

I just don't think the wisdom to make selections and choices and to target, if you will, in a complex society such as ours no less in—when that society is engaged in an international one-world marketplace can be centralized in Washington. So I think it's important that across a whole array of activities we disseminate and put out into the field greater decisionmaking. And I would hope that the ultimate legislation that comes forth with respect to the National Laboratories and they are interfaced with industry would do that. I know because I've spent 35 years in industry, that if I go into a national laboratory which is a local institution as far as I'm concerned—if I live in Idaho or live in Chicago—I'm talking with local people, and I can cut a deal with local people.

But as soon as those local people tell me that I have to come to Washington and fight my way through the maze of the agencies and bureaucracies—and I think we heard eloquent testimony this morning about the effect that bureaucracy can have in impeding progress on all fronts.

As soon as I'm informed that I have to do that, I've lost 95 percent of my interest in working with that Federal laboratory. It's enough of a problem to engage in a constructive cooperative activity between private industry and the Federal Government, but let's keep it at the level that it can be coped with—the local level.

I am a strong believer in local initiative. You heard some excellent testimony this morning that dealt with activities that are going on throughout the country that are addressing on the local level this issue of U.S. industrial competitiveness. I would be all supportive of Washington in encouraging and catalyzing and removing barriers from that kind of an activity.

I think it's perfectly marvelous for the State of Wisconsin, or the State of Texas, or the communities of Dallas/Fort Worth to decide that they are going to marshal their forces and compete in this world marketplace by targeting and I can use that word on the local level—their collective strengths. That means their university system, their local industry, and their local government. And I would applaud all of those local initiatives.

I think, with respect to the broad issue of what Washington can do with respect to international competitiveness, I would make it a matter of national priority. And my frustration—if I can use that word—is that we have conducted many studies, as you pointed out, we have lots of hearings on the subject, the administration talks to the subject, Congress talks to the subject. But the imperative does not seem to come forth from Washington with the strength and the vigor and the voice that I would personally like to see. And that is a matter not solely for the Congress, but it's obviously a matter for the administration too.

Mr. **Brown**. Strong leadership and informed leadership that has a perception of what the real problems are and the directions that we should be moving is an essential ingredient here but it can't be created by legislation.

The problem may be bigger than all of us.

Mr. Radcliffe, I was interested in your statement that the manufacturing sector is really not decreasing, we are not deindustrializing. The relative role of manufacturing is still about as important as it has been over the last 25 years. But that the employment is down. The number of people involved, and the number of people in good jobs, maybe overly good jobs, is going down. And we've seen this going on in many parts of the country, which means as we improve the productivity of manufacturing, we are able to produce more with less manpower. And let's assume that we become perfect at this, and pretty soon we are in the same position in manufacturing as we are in agriculture—we reduce the number of people necessary to produce all the food and fiber we need to a very small fraction, and that fraction's going to drop by one-half in the next 10 years.

What kind of thinking do we do about how we cope with that situation?

Where is the leadership that's going to say how do we handle 1 million displaced farmers, or a couple million displaced industrial workers?

How do we maintain the advantage that we've always had from having a highly adaptable society which, incidentally, is an advantage that we have over the Japanese—they do not have such a society, and they are beginning to see the problems resulting from that at the present time?

Mr. RADCLIFFE. Well, Mr. Chairman, I think the figures that I quoted on——

Mr. BROWN. I want to hear you. Speak up loud and clear here.

Mr. RADCLIFFE. The figures——

Mr. BROWN. The audience wants to hear you, too.

Mr. RADCLIFFE. The figures that I quoted are indeed, I believe, correct. They—a friend of mine who is an English economist, some years ago faced the problem you just posed in the United Kingdom. And he looked at the history of the United Kingdom, which has not been—just been a little ahead of in a sense, at least I hope it's not a—a picture of what we might move toward. But he looked at the demise or the reduction of the agricultural sector and in perfectiveness—what you are looking at is the perfectiveness of production is increasing and you are requiring fewer people to do it.

Now, in some instances—perhaps farming is not one of them, but certainly 19th century farming was—but as you move people out of the more unpleasant jobs, which I think is one advantage of the type of move toward automated or computer integrated manufacturing that was spoken to earlier—these are clearly, I think, advantageous. Most workers would see that as advantageous.

Where we run into problems—and my friend ran into it long before I thought of it, because he looked out in the future of the United Kingdom economy and he saw there could be improvements, continued improvements in the productivity of United Kingdom manufacturing. And he has been right to an extent. It has not been very effective in the international market, but it has improved productivity. It has diminished in size, more so than these figures—these relative figures I was talking about here.

But—and he sees—what he questioned was, well, what do we do with—where are the jobs coming? And what sort of society do we move toward?

And he reluctantly came to the conclusion that he couldn't see any way of avoiding, try as he could, an inevitable reduction in the real standard of living of the United Kingdom over time, because there is eventually the service economy increased in size, because these figures I quoted are a 30-year period but that's not very long in economic history. And I think eventually as productivity continues to increase, we would expect to see a further dimunution in employment in those industries—not necessarily output.

So just as the farmers in America produce all we need with, what, 2 percent of the population instead of 50 percent, so in time, manufacturing could do that here, unless we give in to the Japanese and they do, or some other country—so I think South Korea is a little more terrifying than Japanese these days.

So, I don't have an answer to your long-term problem. However, I think it is a long-term problem, and I think what we are going to be faced with through the rest of this century and probably the first couple of decades after that, is a gradual shift. And that, I think, is, in principle, a little easier to deal with. But we do have to worry about the fact that some of these job displacements are causing people to be out of work—for various reasons don't want to move into other areas, or they have moved into service-type jobs for which the educational and other requirements are less demanding and the pay is lower.

So you are beginning to see in some areas of the country that whil the employment has gone up, real income is going down. And that's why I posed this third question because I see this as a central achievement of the U.S. society, that over several hundred years it succeeded in improving more so than any other country in the world the standard of well-being of its citizens. And I hope it can continue to find ways of doing that, and I hope the committee can give it some attention.

Mr. **Brown**. That's the wrong way to approach it. We are looking for you to answer the questions, not for the committee to.

Mr. **Radcliffe**. Well, Mr. Chairman, can I make very quickly a couple of quick suggestions. I am taking my watch and looking at my watch not because I am being rude and suggesting it's lunchtime, but because I wanted to show you this watch. This is a plastic looking watch. It's a rather nice design, and it's called a Swatch. And this is the result of a collaborative, cooperative R&D program by the Swiss watch industry, which was going into somewhat of a demise in the face of competition from mostly Japan but also some other countries.

And despite the difficulties that the industry had had in working together before, I think with some encouragement but not too much from the Swiss Government, they got themselves together and launched an R&D program among a lot of very suspicious companies. They encouraged a rationalization—as it's called in Europe—or reorganization of the industry, which caused a lot of changes in job structure, but they have ended up with a smaller industry but one which is viable, extremely competitive on the world market. This watch cost me, I think, $20 a year or so ago. It would now be $30—but in the same place. But that's an exchange problem, not the value of the actual watch.

So I use that to drag out an old bogeyman that has appeared before your committee before, and that is the question of cooperative R&D efforts. But I'm not talking of the sort of thing which is going on in Texas, or which is also elsewhere in the electronics industry, which mostly involves larger companies.

You very wisely chose today to have one person from a university one person from what is now a multibillion dollar company as a result of the combination of two very large companies; one person from a very small company; and someone from a medium-size company.

Now, my impression is that about 85 percent of the R&D support by industry in this country is from companies with over 10,000 employees. And, by and large, they don't need to cooperate very much. They are over the minimum effective size. They have good research programs—places like Allied-Signal now have two good research programs.

But I think it's very difficult for a very small company, and it's not too easy for medium-size companies to do this. And yet, there's not very much in the way of encouragement. Hitherto the antitrust bogeyman has been held up—that's cleared away a little now. But I think the word has not gotten around that much and there is still a wide area—the majority of U.S. industry which I think could benefit from encouragement for cooperative activities.

And this links finally to another point, and that is Congressman Ritter drew attention to what he sees as the importance of what I think he called the rising from the grassroots effect. I think you have another speaker who spoke just a few minutes ago about the importance of State programs and encouraging that.

I'd like to endorse that because it also fits in with this medium smaller company idea. And that is there are something like 40 or so, I think, State programs of one kind or another, in existence at the present time. The intention is to try to bring new technology, new industry, to their States. And they're finding various ways of using their own resources to do this.

The thing that troubles me, and I think troubles Robert Pry, who has also appeared before your committee, is that we see the possibility over the next 2 or 3 years that there could be another recession in the American economy. Hopefully not, but it's not impossible.

Under those circumstances, I think the State programs, which are sort of marginally funded—at least in some of the States, there are rich and poor ones—are likely to fold. And that would be a great tragedy because they are moving in the right direction. They have this working relationship with companies on the spot. They know what the problems are. They know what the opportunity is. It's a local bureaucracy but it's effective.

And I'm suggesting that this area might merit the committee's attention from the point of view of not building it into a large new department, as your legislation is suggesting, but biting off something a little smaller, to try to get the Federal Government to recognize the importance of this development for the future of American industry, and to find a way of linking Federal efforts more effectively with the State efforts to try and bridge that difficult transition.

Thank you.

Mr. **Brown**. I'm trying to give a long-range focus to this problem. Dr. Tribus commented on the great importance of involving an entire work force in efforts at quality control, improve productivity, which was the lesson that Deming gave to the Japanese.

And it may well be that the importance of that is not so much in improving the quality of production, or the quality in cost, but improving the quality of life for the workers who are able to participate and feel that their role is more significant in a work environment.

There are limits to which you can continue to improve the quality and cost of your product; you find that your markets can't absorb it all, as the Japanese are finding out. And the Chinese, for example, are beginning to turn on the Japanese because the Japanese are not allowing them to participate in this growth process that they've gone through. And then as the Japanese economy has been geared to this continuing export market, and as that begins to decline, they are finding that their work force no longer has the growth opportunity that they had, and they don't know how to cope with that problem. They don't know how to handle the problems of readjustment as you saturate a finite market—and, of course, saturating a market is always limited to the time and place. Markets grow and expand all the time.

But what are the growth markets that we can adapt to, and, continue to apply these principles of quality improvement and cost, and productivity improvement, so that we get the maximum output for the most creative human involvement. That is, through a process that involves the best contribution of the workers.

And looking down the road 10, 15, 20 years, I am not sure that I see an answer to that problem unless we are all going to go into financial services or fast food. And that's not the kind of a society that I like to contemplate either. And as we automate information flows, which is a key to a lot of this, we will find even those jobs are being reduced. Everything will be packaged and handled by a computer, a robot, or an automated system of some sort.

That's a problem that we advanced as a bogeyman 25 years ago, you know. At certain industries subject to a high degree of automation, the question always was: Who's going to buy the product after you've automated the production? And that's a very good question, you know.

Mr. Ritter, I've been just waiting for you to get back in the event that you have any further questions or discussion.

Mr. RITTER. Mr. Chairman, having just returned, I don't. I apologize for not being here. It's an issue that's so very close to my own heart. I might add that we just had a press conference on the formation of a task force on liability insurance and tort reform. And many of those issues relate to the heart of America's inventiveness and innovation ability to be competitive with the Japanese. And, you know, what I'd like to see, is the inventor, the innovator, the producer, the engineer, back in a position of primacy, and some of the litigators, and paper entrepreneurs being relegated to the roles that they used to play; And have the leadership in the technological community understand the products that they produce. And it seems to me that that's crucial to gaining quality. If the leadership of a technological enterprise is composed of lawyers and accountants, it's going to be very hard to deal with a product improvement culture in terms of what Dr. Tribus was talking about.

Thank you, Mr. Chairman, I yield back.

Mr. BROWN. Gentlemen, I'm afraid I was starting to get into a more philosophical discussion than we should have been involved in here. I very much appreciate the stimulation of your presentation this morning.

We are going to continue with this for 2 more days. And tomorrow we will focus on the subject of quality control and we will hear some other outstanding witnesses, including the one you mentioned, Dr. Tribus, Dr. Juran.

Mr. RITTER. Will the chairman yield?

Mr. BROWN. Yes.

Mr. RITTER. If you might yield, it did occur to me that I wanted to ask something of this panel.

Mr. BROWN. Please do.

Mr. RITTER. Thank you.

The Federal Government is not necessarily the "be-all-and-end-all" to solving this problem but maybe, Lord knows, a big part of it. But it has always occurred to me that industrial competitiveness as a subject never really had a home.

Do you feel that legislation of this kind gives visibility and prominence to the questions of industrial competitiveness?

Mr. Chenault, do you want to start off?

Mr. CHENAULT. Well, I am not as familiar with the legislation, obviously, as I should be. You are talking about what was discussed earlier today in terms of concerting the agencies of Government, the offices, and building them around international trade, and our initiatives. I think that would be a good idea, yes. We are facing more forceful centralized competition from overseas as nearly as I can tell.

Mr. RITTER. Mr. Radcliffe.

Mr. RADCLIFFE. I'm afraid I don't think so. In the first place, there are already at the other end of town a number of offices that believe they are involved in international competitiveness. I think OSTP does know something about it and the International Trade Commission, and the Department of Commerce has undertaken a whole series of so-called competitive assessments of individual, major, American industries in the hope that the resulting information that's engendered looking at the industries from outside, can be helpful, both to the industries themselves, and also in the administration, and the Congress identifying acceptable paths to go to try and help the process.

So, I think there are a number of boxes in place. I agree with you, there is no one single place. But, quite frankly, I do not see that the present bill, as I have read it, would give us any great advantage in that, desirable as it is.

Mr. RIVERS. Congressman, I can't speak to the specifics of the legislation. I did speak before in discussion to the concern that I have over the fact that we had not raised the industrial competitiveness issue to the level of a national priority that I believe that it is indeed essential that we do.

And to the extent that a national debate, if you will, over the specifics of the proposed legislation would help to do that, I would think that that would certainly be a step in the right direction. And, hopefully, that national debate would sort through the wisdom and the balance that needs to be struck between the inherent weaknesses in centralization and the inherent advantages of decentralization. And that to the extent that the debate would bring those issues into greater clarity and at the same time help to focus the attention of the Nation on the critical nature of the problem, then I say all speed with the debate.

Mr. **Brown**. Dr. Tribus, would you like to come back to the table and——

Dr. **Tribus**. Yes, sir.

Mr. **Brown** [continuing]. Offer a comment here?

Before you speak, I would like to say that I think what this committee is trying to do is not come up with some magic new solution to a problem which we see the complexity of. But perhaps more aptly to engage in a process of quality control, quality improvement, with regard to the functions that we are inadequately performing at the present time.

Maybe that's an impossible task, given the bureaucratic culture, but we see so many efforts that are fragmented, ill coordinated, not filling all of the gaps—for example, our national data base for making decisions by the leadership is completely inadequate, it seems to me. Improving the quality of what we are trying to do now might be a substantial contribution on the part of the Federal Government, and why should we be exempt from quality improvement.

Dr. Tribus.

Dr. **Tribus**. Well, I would like to pick up on that.

I've served in the Department of Commerce and I am aware of the data-gathering activities of OSTP and others. They're fragmented, they're not purposeful. When my successors in the Department of Commerce tried to make competitive assessments, they used the existing data bases but these are not well coordinated. They are not coordinated in time. Some data are missing. They do the best they can with limited data.

In the Department of Commerce, they do not have the authority to make the studies and to get the data required to do what needs to be done. So when it is suggested that since we already have many organizations in the field doing little bits and pieces, we don't need to pull them together, I do not agree at all. They do need to be pulled together.

I testified in the hearings for the budget of the Department of Commerce a number of years ago, and made an analysis of what was done in the different parts of the agencies. It is badly fragmented. Furthermore, in the Department of Commerce, no one is authorized to make the kinds of studies we need. They make studies based on mandates of years ago just to provide general information on how things are going. They are not pulling together information to help us understand the world situation the way the Japanese can understand it.

Through JETRO, which is kind of an international information vacuum cleaner, the Japanese pull together information from all over the world and make it easily available at computer consoles. So if you want to study the trends of an industry you have access to a really extraordinary data base. In the United States you can't do anything like that. In fact, the smart thing to do is to get a Japanese partner so you can have access to JETRO.

We need to do something like that. I disagree with saying there are lots of agencies in place that do this, therefore, we don't need another one. They need coordination.

Mr. **Brown**. One thing we are trying to do is encourage more U.S. citizens to understand Japanese and to gain greater sophistication and access to Japanese literature and thinking which will be helpful to us.

Dr. **Tribus**. Mr. Chairman, you are absolutely right.

The testimony that I gave and that you were impressed by was put together with the help of Bob Wood—the only journalist I know who speaks Japanese, who has spent a long time in Japan, and understands quality. He was able to help me put together many of the facts and figures I would not have had by myself because I don't speak Japanese.

Mr. **Brown**. Gentlemen, we have the second bell, two bells, we are going to have to either recess or adjourn. And because we are encroaching on the noon hour, I think it would be better if we adjourned at this point.

I want to thank you again for your excellent presentation. It gives us a very good start on the next 2 days in which we are going to be looking more specifically at some aspects of this problem.

With that, we will declare the subcommittee adjourned.

And, Mr. Radcliffe, I would appreciate it if you could help us put together in written form for the record the kind of statement you want to make, and any additional comments or statements any of you would like to submit for the record we would be more than pleased to have.

[The information follows:]

TESTIMONY OF DR. S. VICTOR RADCLIFFE

VICE PRESIDENT, CORPORATE DEVELOPMENT
NATIONAL FORGE COMPANY

before

THE SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY
SCIENCE AND TECHNOLOGY COMMITTEE
HOUSE OF REPRESENTATIVES
U.S. CONGRESS

HEARINGS ON STRATEGIES FOR EXPLOITING AMERICAN INVENTIVENESS IN THE WORLD MARKET PLACE (24, 25 & 26 JUNE, 1986)

TUESDAY 24 JUNE 1986:

- VIEWS ON BARRIERS TO TECHNOLOGY UTILIZATION AND THE PROBLEMS OF COMPETING INTERNATIONALLY.

I APPRECIATE THE INVITATION TO GIVE MY PERSONAL VIEWS ON TECHNOLOGY AND THE INTERNATIONAL COMPETITIVENESS OF U.S. INDUSTRY BEFORE THE SUB-COMMITTEE AT THESE HEARINGS. MY VIEWS REFLECT A CAREER AS A PROFESSOR OF ENGINEERING AND CONSULTANT TO INDUSTRY, AS STAFF TO THE SCIENCE ADVISOR TO PRESIDENT FORD, AS ONE OF THE FOUNDERS OF A HIGH-TECHNOLOGY "START UP" COMPANY ON BOSTON'S ROUTE 128, AND AS AN OFFICER IN A BASIC INDUSTRIAL COMPANY.

A BRIEF "OVERSIGHT"

AS I HAVE FOLLOWED DEVELOPMENTS BY THE COMMITTEE IN THIS AREA OF TECHNOLOGY AND COMPETITIVENESS OVER SEVERAL CONGRESSES, I BELIEVE IT MIGHT BE HELPFUL TO BEGIN MY REMARKS WITH SOME OBSERVATIONS ON HOW THESE DEVELOPMENTS SEEM TO AN OUTSIDE OBSERVER.

THE FEDERAL GOVERNMENT HAS BEEN GENERALLY SUCCESSFUL IN ENSURING THAT TECHNOLOGY IS GENERATED AND APPLIED EFFECTIVELY TO MEET NATIONAL NEEDS IN SUCH AREAS AS DEFENSE AND SPACE, AS WELL AS IN BASIC RESEARCH AND GRADUATE EDUCATION IN SCIENCE AND TECHNOLOGY, FOR ALL OF WHICH IT HAS UNIQUE RESPONSIBILITIES. IN CONTRAST, THE DIRECT FEDERAL GOVERNMENT ROLE IN TECHNOLOGY FOR AMERICAN CIVILIAN INDUSTRY HAS BEEN MODEST COMPARED WITH THAT OF GOVERNMENTS IN MANY OF THE ADVANCED COUNTRIES THAT ARE AMONG OUR PRINCIPAL COMPETITORS INTERNATIONALLY AND IN OUR DOMESTIC MARKETS. ACCORDINGLY, WHETHER OR NOT AND HOW THERE MIGHT BE A STRONGER AND MORE DIRECT GOVERNMENT ROLE IN THE DEVELOPMENT AND USE OF TECHNOLOGY BY AMERICAN INDUSTRY HAS LONG BEEN A CENTRAL CONCERN OF THE COMMITTEE - AND A MAIN DRIVING FORCE IN EXPLORING NEW LEGISLATIVE INITIATIVES.

THE INCREASING SUCCESS OF FOREIGN FIRMS IN THESE MARKETS OVER THE PAST SEVERAL YEARS - FOR PRODUCTS BOTH FROM OUR TRADITIONAL INDUSTRIES AND FROM SOME OF THE NEWER HIGH-TECHNOLOGY INDUSTRIES - HAS SHARPENED THAT CONCERN. THUS, THE COMMITTEE HAS ADDRESSED, AND CONTINUES TO ADDRESS, SUCH QUESTIONS AS:

o WHAT INHIBITS ADEQUATE INVESTMENT BY AMERICAN FIRMS IN THE TYPES OF RESEARCH AND DEVELOPMENT NEEDED TO ENSURE THEIR LONG-TERM COMPETITIVENESS ?

o DO THE PRESSURES IN THE AMERICAN SYSTEM FOR "GOOD" R&D RESULTS WITH ECONOMIC PAY-OFF IN THE SHORT TERM DRIVE TOO MANY COMPANIES AWAY FROM SEEKING THE "BEST" BUT LESS CERTAIN R&D RESULTS THAT WILL BE NECESSARY FOR THE COMPETITIVE SUCCESS OF U.S. INDUSTRIES AND THE HEALTH OF THE U.S. ECONOMY OVER THE LONGER-TERM ?

o IS THERE NOT A WAY, ACCEPTABLE IN THE AMERICAN POLITICAL CONTEXT, FOR THE FEDERAL GOVERNMENT TO BECOME MORE STRONGLY AND DIRECTLY INVOLVED IN COMPLEMENTING INDUSTRY'S OWN EFFORTS TO DEVELOP AND APPLY THE IMPROVED AND NEW TECHNOLOGIES SEEN AS ESSENTIAL TO THAT FUTURE ?

THE DISCUSSIONS INSIDE AND OUTSIDE THE COMMITTEE HAVE BROADLY AGREED ON A NEED FOR THE FEDERAL GOVERNMENT TO ENCOURAGE TECHNOLOGICAL INNOVATION IN CIVILIAN INDUSTRY. THEY HAVE GENERALLY DISAGREED ON THE MEANS. EVEN SOME INDIRECT MEASURES - FOR EXAMPLE, TAX CREDITS FOR INDUSTRIAL RESEARCH AND DEVELOPMENT EXPENDITURES - HAVE BEEN CRITICIZED RECENTLY AS HAVING PROVEN INEFFICIENT IN PRACTICE. INDEED, BOTH THE HOUSE AND SENATE VERSIONS OF THE ONGOING TAX REFORM LEGISLATION HAVE CLEARLY TURNED AWAY FROM TAX INCENTIVES AS A STIMULUS TO INDUSTRY TO

INVEST IN EQUIPMENT AND FACILITIES, EVEN THOUGH SUCH INVESTMENT IS AN ESSENTIAL PART OF TECHNOLOGICAL INNOVATION. OTHER INDIRECT MEASURES HAVE PROVED MORE ACCEPTABLE, AND SEVERAL HAVE SHOWN ENCOURAGING RESULTS. FOR EXAMPLE, ANTITRUST LAW CLARIFICATION IS ACCELERATING COOPERATIVE RESEARCH ARRANGEMENTS AMONG FIRMS IN A GIVEN INDUSTRY . IN A RELATED AREA, INCREASED - IF UNCERTAIN - SUPPORT HAS EMERGED IN THE CONGRESS FOR ENGINEERING EDUCATION AND RESEARCH, INCLUDING SOME SPECIFIC PROGRAMS RELATED TO MANUFACTURING TECHNOLOGIES THAT ARE CREATING ACTIVE NEW EFFORTS IN UNIVERSITY/INDUSTRY COOPERATION.

HOWEVER, THE USE OF DIRECT MEASURES AS A MEANS TO STIMULATE CIVILIAN TECHNOLOGY REMAINS STRONGLY CONTROVERSIAL. THIS IS ESPECIALLY THE CASE ON THE ISSUE OF THE DESIRABILITY OR OTHERWISE OF ANY NEW FEDERAL AGENCY INTENDED TO PROVIDE A FOCUS FOR GOVERNMENT POLICY AND MORE DIRECT INVOLVEMENT IN ATTEMPTS TO IMPROVE INDUSTRIAL INNOVATION AND COMPETITIVENESS.

IN ALL OF THE COMMITTEE'S DISCUSSIONS, PERHAPS THE ONLY AREA OF BROAD CONSENSUS HAS BEEN FOR GOVERNMENT TO UNDERTAKE OR SUPPORT STUDIES OF THE U.S. COMPETITIVE POSITION IN SPECIFIC TECHNOLOGIES OR INDUSTRIES. UNTIL RECENTLY, SUCH STUDIES HAD BEEN FEW COMPARED WITH THE MORE USUAL "NATIONAL COMPARISONS". YET IT IS PRECISELY THAT TYPE OF UNDERSTANDING WHICH IS MOST LIKELY TO RAISE THE RIGHT QUESTIONS. IT COULD ALSO SUGGEST POSSIBLE GOVERNMENT ROLES THAT MIGHT BE MORE EFFECTIVE IN STABILIZING AND IMPROVING THE LONG-TERM COMPETITIVE POSITION OF U.S INDUSTRY, AND IN GAINING THE WIDEST PUBLIC SUPPORT.

THREE POINTS FOR THE COMMITTEE'S CONSIDERATION

I WOULD LIKE TO DRAW ATTENTION TO THREE POINTS WHICH HAVE EMERGED CONSISTENTLY AS BEING IMPORTANT FROM THE VARIETY OF STUDIES OF THE U.S.MANUFACTURING SECTOR AND COMPETITIVE ASSESSMENTS OF SPECIFIC INDUSTRIES THAT HAVE APPEARED OVER THE PAST 18 MONTHS. THESE POINTS BEAR DIRECTLY ON THE COMMITTEE'S CENTRAL CONCERN, AND MAY SUGGEST A SOMEWHAT DIFFERENT EMPHASIS FOR PROSPECTIVE LEGISLATION.

POINT I: THE WIDESPREAD BELIEF THAT THE UNITED STATES IS "DEINDUSTRIALIZING" COMPARED WITH OTHER ADVANCED COUNTRIES APPEARS UNFOUNDED.

THE U.S. MANUFACTURING SECTOR HAS NOT CHANGED SUBSTANTIALLY AS A SHARE OF THE REAL GROSS NATIONAL PRODUCT(GNP) OVER THE PAST 30 YEARS. IT WAS 24.5% IN 1950, 25.9% IN 1973, AND 23.9% IN 1984. IN ABSOLUTE TERMS, IT HAS CONTINUED TO GROW WITH REAL GNP. WHAT APPEARS TO BE THE PRIME CAUSE OF THE WIDELY HELD BELIEF THAT THE U.S IS "DEINDUSTRIALIZING" IS THAT MANUFACTURING'S SHARE OF VALUE-ADDED IN CURRENT PRICES HAS DECLINED OVER MORE THAN TWO DECADES. IN FACT, THAT HAS OCCURRED IN ESSENTIALLY ALL INDUSTRIALIZED COUNTRIES DUE TO HIGHER RATES OF INCREASE IN PRODUCTIVITY IN MANUFACTURING THAT SLOWED PRICE INCREASES COMPARED WITH THE SERVICE SECTOR, AND TO CONSUMERS SPENDING MORE OF THEIR GROWING INCOME IN SERVICES RATHER THAN ON GOODS.

WHAT IS MUCH MORE IMPORTANT IS THAT THERE HAVE BEEN CONSISTENT DECLINES IN U.S. MANUFACTURING'S SHARE OF CAPITAL STOCK AND MORE SO IN EMPLOYMENT, TOGETHER WITH MAJOR SHIFTS IN THE MIX OF INDUSTRIES THAT MAKE UP THE MANUFACTURING SECTOR.

SOME OLDER INDUSTRIES ARE SHRINKING IN SIZE, WHILE NEW INDUSTRIES ARE GROWING. THUS, RATHER THAN A REAL LOSS OF INDUSTRIAL PRODUCTION, IT IS THE PROBLEMS ASSOCIATED WITH CHANGES IN THE OVERALL STRUCTURE AND LOCATION OF U.S. MANUFACTURING, ALONG WITH A DECLINE IN JOBS IN SPECIFIC INDUSTRIES AND PARTS OF THE COUNTRY THAT MERIT THE WIDESPREAD CURRENT PUBLIC CONCERN IN THE CONGRESS AND ELSEWHERE ABOUT THE FUTURE OF AMERICAN INDUSTRY. HOWEVER, A CONTINUATION OF AN ESSENTIALLY CONSTANT MANUFACTURING SHARE OF REAL GNP CANNOT BE A FOREGONE CONCLUSION: THE BALANCE OF OUTPUT DECLINES AND INCREASES FROM ESTABLISHED AND NEW INDUSTRIES WILL CHANGE TO AN OVERALL DECLINE IF TRENDS IN U.S. COMPETITIVENESS PERSIST.

THE CURRENT PROBLEM IS WELL ILLUSTRATED BY WHAT IS HAPPENING IN CAPITAL GOODS MANUFACTURING. WHILE REAL INVESTMENT SPENDING IN THE UNITED STATES HAS REACHED NEW HIGHS IN THE RECOVERY FROM THE RECENT DEEP U.S.ECONOMIC RECESSION, THE PATTERN OF SPENDING HAS CHANGED DRAMATICALLY FROM THAT OF PREVIOUS RECOVERIES. THE PRINCIPAL DEMAND HAS BEEN FOR OFFICE, COMPUTING, ELECTRICAL AND COMMUNICATIONS MACHINERY, AND INSTRUMENTS - INVESTMENTS TO IMPROVE EFFICIENCY AND PRODUCTIVITY RATHER THAN IN THE HEAVIER CAPITAL GOODS REQUIRED FOR CAPACITY REPLACEMENT OR EXPANSION. THAT SHIFT IN DEMAND MIX WAS EXACERBATED BY THE SINGULAR DECLINES IN DEMAND FROM THE DEPRESSED U.S.OIL AND GAS, AND AGRICULTURAL SECTORS, AND BY THE RAPID RISE IN THE DOLLAR FROM ITS 1980/81 LEVELS TO SUCH HEIGHTS THAT TECHNOLOGICAL INNOVATION COULD DO LITTLE TO STEM THE RESULTING TIDAL WAVE OF IMPORTS. THE LATTER EFFECT ALSO ESPECIALLY IMPACTED MOST MATERIALS AND COMPONENTS

MANUFACTURERS. CONSEQUENTLY, A SIGNIFICANT SEGMENT OF U.S. MANUFACTURING HAS "LAGGED BEHIND" IN ITS PARTICIPATION IN THE "BOOM" SINCE EARLY 1983 IN OVERALL U.S. DOMESTIC SPENDING ON CAPITAL GOODS.

THE DOLLAR HAS NOW FALLEN RADICALLY AGAINST THE CURRENCIES OF SEVERAL - BUT BY NO MEANS ALL - OF AMERICA'S PRINCIPAL TRADING PARTNERS SINCE THE ADMINISTRATION'S BELATED RECOGNITION OF ITS DAMAGING EFFECTS ON THE U.S. ECONOMY. THAT CHANGE IS SLOWLY SHOWING SOME MODEST BENEFICIAL EFFECTS FOR MANY CLASSES OF U.S. MANUFACTURED GOODS IN INCREASING EXPORTS, AND RAISING PRICES FOR SOME IMPORTS. HOWEVER, EVEN A RETURN TO THE MORE "NORMAL" EXCHANGE RATE CONDITIONS OF 1980/81 IS NOT GOING TO RESOLVE THE INTERNATIONAL COMPETITIVE PROBLEMS FOR MUCH OF U.S.MANUFACTURING.

YET THE IMPORTANCE OF SUCCESS IN OVERCOMING THEM IN THE GLOBAL MARKET IS WELL RECOGNIZED BY MANY U.S. MANUFACTURING COMPANIES. THEY SEE NOT ONLY THE CURRENT PROBLEM OF SHARP IMPORT COMPETITION, BUT ALSO THE OPPORTUNITY OF GLOBAL MARKETS AS THE UNITED STATES HAS INCREASINGLY BECOME A "TRADING NATION". THEY HAVE SEEN THE EXPORT (AND IMPORT) LEVELS OF MANUFACTURED GOODS AS A SHARE OF U.S.MANUFACTURING OUTPUT RISE FROM LESS THAN 10% IN 1950 TO APPROACHING 25% IN THE EARLY 1980'S, BEFORE THE SURGE IN THE DOLLAR. THE QUANDARY FACING MANY WEAKENED SECTORS OF U.S. INDUSTRY IS HOW TO UNDERTAKE THE CONSIDERABLE CAPITAL INVESTMENTS NECESSARY TO MAKE THE TECHNOLOGICAL AND OTHER CHANGES ESSENTIAL TO MEET BOTH THE IMPORT CHALLENGE AND THE GLOBAL OPPORTUNITIES.

POINT II: A BROAD ARRAY OF FACTORS HAVE BEEN SHOWN TO INFLUENCE INTERNATIONAL COMPETITIVENESS, AND THEIR RELATIVE IMPORTANCE CAN DIFFER WIDELY FROM INDUSTRY TO INDUSTRY.

PERHAPS SURPRISINGLY, THERE IS AS YET NO CLEAR CONSENSUS ON EITHER A DEFINITION OF INDUSTRIAL COMPETITIVENESS, OR ON HOW TO MEASURE IT. HOWEVER, THERE IS WIDE AGREEMENT ON A COMPLEX ARRAY OF FACTORS AS BEING THE MAIN INFLUENCES ON IT. TO DEAL WITH THIS COMPLEXITY, ESPECIALLY IN ASSESSING THE ROLE OF TECHNOLOGY IN IMPROVING COMPETITIVENESS, IT IS HELPFUL TO RECOGNIZE THREE BROAD CATEGORIES OF COMPETITIVE FACTORS.

THE FIRST CATEGORY CONSISTS OF THE FACTORS INVOLVED IN THE CLASSIC ECONOMIC CONCEPT OF COMPARATIVE ADVANTAGE - INCLUDING ENERGY AND OTHER MATERIAL RESOURCE INPUTS, LABOR, CAPITAL EQUIPMENT, AND PRODUCT AND MANUFACTURING TECHNOLOGIES. THE SECOND CATEGORY INVOLVES KEY ECONOMIC FACTORS SUCH AS INTEREST RATES, INFLATION RATES AND EXCHANGE RATES - WHICH ARE BEYOND THE CONTROL OF THE INDIVIDUAL FIRM OR INDUSTRY, YET GREATLY INFLUENCE THEIR PERFORMANCE. SUCH FACTORS ARE STRONGLY INFLUENCED, BUT NOT COMPLETELY CONTROLLABLE, BY FEDERAL FISCAL AND MONETARY POLICIES. IN ADDITION, A VARIETY OF GOVERNMENT DOMESTIC POLICIES IMPACT THE ABILITY OF AMERICAN FIRMS TO COMPETE WITH FOREIGN FIRMS IN THE U.S. AND ABROAD. OBVIOUS EXAMPLES ARE POLICIES DEALING WITH ENVIRONMENT, HEALTH AND SAFETY STANDARDS, WITH EDUCATION, CIVILIAN AND MILITARY RESEARCH, AND NATIONAL SECURITY. FINALLY, A THIRD CATEGORY INCORPORATES FACTORS INVOLVING GOVERNMENT INTERVENTION IN INTERNATIONAL TRADE - THROUGH TARIFF AND NON-TARIFF BARRIERS, AND DIRECT AND INDIRECT SUBSIDIES.

FOR THE UNITED STATES, TECHNOLOGY AND QUALITY OF THE WORK FORCE HAVE PROVIDED COMPARATIVE ADVANTAGE INTERNATIONALLY FOR MANY INDUSTRIES. (IN THE PRESENT GLOBAL COMPETITIVE ENVIRONMENT, IT IS IMPORTANT TO NOTE THAT THE U.S. "TECHNOLOGY EDGE" HAS BEEN PREDOMINANTLY FOR PRODUCT INNOVATIONS. THE U.S. HAS LAGGED IN INNOVATIONS IN MANUFACTURING PROCESSES.) CONVERSELY, HIGH U.S. LABOR COSTS COMPARED WITH THOSE IN MOST COMPETING COUNTRIES IMPOSE COMPARATIVE DISADVANTAGE. IN RECENT YEARS, U.S. INTEREST AND EXCHANGE RATES HAVE BEEN A COMPETITIVE DISADVANTAGE. DOMESTIC POLICIES VARY CONSIDERABLY IN THEIR EFFECT - SOMETIMES STRENGTHENING, AND SOMETIMES WEAKENING THE INTERNATIONAL COMPETITIVENESS OF U.S. INDUSTRIES - AND IN THEIR IMPACT ON SPECIFIC INDUSTRIES. FINALLY, U.S. TRADE POLICIES AND INTERNATIONAL TRADE LAWS - ESPECIALLY TO THE EXTENT THAT SUCCESSIVE U.S. ADMINISTRATIONS HAVE BEEN LESS THAN SUCCESSFUL IN ENFORCING THEM IN THE INTERESTS OF U.S. INDUSTRIES - HAVE GENERALLY LED TO COMPETITIVE DISADVANTAGE.

IT IS CLEAR THAT IN ANY GIVEN INDUSTRY, A TECHNOLOGICAL INNOVATION THAT OVERCOMES *COMPARATIVE* DISADVANTAGES WILL NOT NECESSARILY RESULT IN *COMPETITIVE* ADVANTAGE INTERNATIONALLY. THE ACTUAL RESULT WILL DEPEND ON THE EXTENT TO WHICH THE INDUSTRY IN QUESTION IS AFFECTED BY THE FACTORS IN THE SECOND AND THIRD CATEGORIES - FEW OF WHICH CAN BE REDRESSED THROUGH TECHNOLOGY.

POINT III: ONE OF AMERICA'S GREATEST SUCCESSES - THE ACHIEVEMENT OF A HIGH AVERAGE STANDARD OF LIVING - PRESENTS ONE OF ITS GREATEST CHALLENGES TO TECHNOLOGY

A NATIONAL OBJECTIVE THAT HAS BEEN CENTRAL AND UNCHALLENGED IN AMERICAN SOCIETY HAS BEEN TO ENSURE THE OPPORTUNITY FOR IMPROVEMENTS IN INDIVIDUAL WELL-BEING - WHICH IN PRACTICE TRANSLATES PRINCIPALLY TO INCREASES IN REAL INCOME LEVELS. TODAY, WAGE AND COMPENSATION RATES IN THE INDUSTRIALIZED COUNTRIES OF WESTERN EUROPE, WHERE MANY OF U.S. INDUSTRIES' COMPETITORS ARE LOCATED, ARE GENERALLY LOWER IN DOLLAR TERMS THAN U.S. RATES. IN JAPAN, THEY ARE NOT MUCH MORE THAN HALF U.S. RATES. THEY ARE EVEN LOWER - ONLY 15% OR LESS - FOR SOME OF THE NEWER COMPETITORS IN DEVELOPING COUNTRIES SUCH AS BRAZIL, SOUTH KOREA AND CHINA. IT IS TRUE THAT RATES, EXPRESSED IN DOLLARS, HAVE BEEN RISING MORE RAPIDLY IN MOST OF THE OTHER INDUSTRIALIZED COUNTRIES THAN IN THE U.S. OVER SEVERAL DECADES, THUS GRADUALLY NARROWING THEIR ADVANTAGE IN WAGE COSTS. HOWEVER, WITH THE SIGNIFICANT DECLINE IN THE DOLLAR SINCE EARLY 1985, ADVANTAGE IN LABOR COSTS IS AGAIN IMPROVING FOR MANY OF OUR FOREIGN COMPETITORS.

WAGE RATES IN THE UNITED STATES THAT ARE HIGH BY INTERNATIONAL STANDARDS ARE HARDLY A NEW PHENOMENON. WHAT IS NOW DIFFERENT FOR SOME U.S. FIRMS AND INDUSTRIES IS THAT GROWTH IN LABOR COMPENSATION (WAGES PLUS BENEFITS) HAS BEEN ESPECIALLY STRONG RELATIVE TO ACCOMPANYING INCREASES IN ABSOLUTE LEVELS OF PRODUCTIVITY. THE RESULT OF A CONTINUED FAILURE TO AT LEAST OFFSET COMPENSATION GAINS WITH PRODUCTIVITY INCREASES HAS BEEN EVENTUALLY TO INCREASE UNIT LABOR COSTS ABOVE THE LEVEL OF

FOREIGN COMPETITORS. HIGH WAGE RATES ARE NOT INCONSISTENT WITH AN INDUSTRY BEING COMPETITIVE INTERNATIONALLY, PROVIDING THAT PRODUCTIVITY IS ALSO HIGH.

IT IS THIS UNIT LABOR COST - OR TOTAL LABOR COMPENSATION THAT MUST BE PAID TO PRODUCE A PHYSICAL UNIT OF A PARTICULAR GOOD SUCH AS AN AUTOMOBILE, A TELEVISION SET, AN INDUSTRIAL COMPONENT, OR A POUND OF INDUSTRIAL METAL OR OTHER MATERIAL - THAT IS THE REAL DETERMINANT OF LABOR COST COMPETITIVENESS. MOREOVER, TOTAL EMPLOYEE COMPENSATION IS THE LARGEST SINGLE FACTOR MAKING UP FIXED AND VARIABLE COSTS IN MANUFACTURING, AND THEREFORE A CRITICAL FACTOR IN OVERALL COMPETITIVENESS. THE DIRECT LABOR CONTENT IS ONLY SOME 15% OF THE TOTAL COST PER UNIT PRODUCED, BUT THE TOTAL LABOR COMPENSATION FOR ALL EMPLOYEES (DIRECT, INDIRECT AND MANAGEMENT) IS TWO TO THREE TIMES THAT LEVEL.

THE PRESIDENT'S COMMISSION ON INDUSTRIAL COMPETITIVENESS - IN ITS APTLY NAMED REPORT "GLOBAL COMPETITION - THE NEW REALITY" - RECOGNIZED THE DESIRE TO MAINTAIN OUR STANDARD OF LIVING IN THESE NEW CIRCUMSTANCES. THEY CONCLUDED THAT "THAT IS A COMPETITIVE DISADVANTAGE THAT AMERICANS WILL DOUBTLESS CHOOSE TO KEEP." UNFORTUNATELY, THE COMMISSION OFFERED LITTLE IN THE WAY OF SPECIFIC RECOMMENDATIONS TO OVERCOME THE MISMATCH WITH PRODUCTIVITY OUTLINED ABOVE. IN THE ABSENCE OF A RESOLUTION OF THIS PROBLEM, IT SEEMS THAT U.S. INDUSTRIAL COMPETITIVENESS MUST CONTINUE TO DECLINE - WITH AN INEVITABLE LOWERING OF AVERAGE LIVING STANDARDS. EQUALLY CLEARLY, TECHNOLOGICAL INNOVATION IS AN IMPORTANT POTENTIAL CONTRIBUTOR TO OVERCOMING THAT PROBLEM. WE HAVE YET TO FIND THE MOST EFFECTIVE WAY TO USE IT.

CONCLUSIONS

I WISH TO SUPPORT STRONGLY THE COMMITTEE'S CONTINUING EFFORTS TO IDENTIFY WAYS BY WHICH THE FEDERAL GOVERNMENT CAN BEST CONTRIBUTE TO THE EFFORTS IN OUR AMERICAN SOCIETY TO ENSURE THE DEVELOPMENT AND APPLICATION OF TECHNOLOGIES ESSENTIAL TO A VIABLE AND GLOBALLY COMPETITIVE U.S. MANUFACTURING INDUSTRY. HOWEVER, I SUGGEST THAT SOME OF THE QUESTIONS THAT HAVE BEEN PROMINENT BEFORE THE COMMITTEE AND HAVE RECEIVED ATTENTION IN PROSPECTIVE LEGISLATION, MAY NOT - OR NO LONGER - BE THE MOST IMPORTANT IN THE NEW CIRCUMSTANCES CONFRONTING THE UNITED STATES.

THE PRECEDING DISCUSSION OF THREE POINTS APPARENT FROM THE RANGE OF STUDIES OF U.S. INDUSTRIAL COMPETITIVENESS INDICATES SOME DIFFERENT QUESTIONS THAT MERIT CONSIDERATION BY THE COMMITTEE:

1. HOW CAN THE FEDERAL GOVERNMENT BEST ENSURE THAT TECHNOLOGY IS NOT ONLY DEVELOPED AND APPLIED, BUT THAT IT IS IMPLEMENTED THROUGH INVESTMENT TO CONTRIBUTE MOST EFFECTIVELY TO BOTH THE GROWTH OF NEW INDUSTRIES AND TO THE OVERALL INTERNATIONAL COMPETITIVENESS OF THE U.S. INDUSTRIAL SECTOR ?

2. HOW CAN THE COMMITTEE ENGENDER A BETTER UNDERSTANDING IN THE CONGRESS AND THE ADMINISTRATION OF THE IMPORTANCE OF TAKING INTO ACCOUNT THE INFLUENCE OF LEGISLATIVE AND REGULATORY ACTIVITIES IN AREAS OTHER THAN TECHNOLOGY ON U.S. INDUSTRIAL COMPETITIVENESS, AND INDEED ON THE ABILITY OF TECHNOLOGY ITSELF TO CONTRIBUTE EFFECTIVELY TO IMPROVING COMPETITIVENESS ?

3. IN WHAT WAYS CAN THE FEDERAL GOVERNMENT SHARPEN NATIONAL ATTENTION TO THE THREAT TO REAL LIVING STANDARDS FROM THE PROBLEM OF THE INCREASING DISADVANTAGE OF U.S. UNIT LABOR COSTS FOR THE COMPETITIVENESS OF U.S. INDUSTRIES IN GLOBAL MARKETS, AND ENSURE GREATER PRACTICAL EFFORTS TO ADDRESS IT ?

THE ANSWERS TO SUCH QUESTIONS ARE NOT OBVIOUS. NEVERTHELESS, AS IS SO OFTEN THE CASE, DEFINING THE RIGHT QUESTIONS CAN BE A MAJOR STEP IN REACHNING OUT TO THE BEST ANSWERS.

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Mr. **Brown**. Thank you very much. The subcommittee is adjourned until tomorrow at 10 a.m.

[Whereupon, at 12:10 p.m., the subcommittee recessed, to reconvene at 10 a.m., Wednesday, June 25, 1986.]

STRATEGIES FOR EXPLOITING AMERICAN INVENTIVENESS IN THE WORLD MARKETPLACE

WEDNESDAY, JUNE 25, 1986

House of Representatives,
Committee on Science and Technology,
Subcommittee on Science, Research and Technology,
Washington, DC.

The subcommittee met, pursuant to call, at 10:25 a.m., in room 2325, Rayburn House Office Building, Hon. George E. Brown, Jr., presiding.

Mr. Brown. The subcommittee will come to order.

Without objection, the Chair will grant permission for taking photographs and taping of the proceedings of the hearing this morning.

I have a brief opening statement. This is the second day in a series of hearings on strategies for exploiting American inventiveness in the world marketplace. This is a continuation of ongoing discussions of this subcommittee regarding the decline of American competitiveness in the global market and the role the Federal Government should serve in being a catalyst for increasing innovation, commercialization of technology, and global competitiveness.

It has been an increasing concern that American industry is losing its technological leadership. Several studies have been conducted and several agendas have been proposed for reversing this situation. Among these have been the report of the President's Commission on Industrial Competitiveness, the so-called Young Commission report, and the agenda for meeting America's competitive challenge which has been proposed by the Steering Committee of the Task Force on High Technology Initiatives of the House Republican Research Committee. There have also been several proposals introduced in Congress over the years, and this subcommittee has held hearings regarding the need for changes in Federal technology policy for the last three Congresses, or considerably longer than that.

We have an opening statement, also, from the Honorable Doug Walgren, the chairman of this subcommittee, and, if he shows up and wishes to make it, he will be allowed to do so. Otherwise, it will appear in the record as if he had been here and eloquently delivered it. In addition to that, we have an opening statement that Mr. Valentine wishes to make, and I expect him to be back very shortly.

[The prepared opening statements of Mr. Walgren and Mr. Boehlert follow:]

OPENING REMARKS
HONORABLE DOUG WALGREN

JUNE 25, 1986

Today's segment of our hearings on strategies for exploiting American inventiveness in the world marketplace should provide an enlightening blend of practical experience in wrestling with these problems and ideas of enhancing U.S. competitiveness. We are fortunate to have with us individuals who have been in the forefront intellectually in the quality movement since its inception as well as representatives of companies who have been successful in meeting the challenge of competitive goods from abroad.

We will begin by hearing from Dale Compton with the National Academy of Engineering here in Washington who will outline the Technological leadership Program being developed by that eminent body to address many of the competitiveness concerns we both have.

We will then discuss the possibility of a National Quality Award with three individuals who have been in the forefront of efforts to allow quality to pervade the American workplace. Dr. Juran, founder of the Juran Institute, is clearly one of the world's leading experts in quality and is credited with being instrumental in the transformation of Japan from an also-ran to a producer of the highest qualtiy goods. Under the leadership of Mr. Hudiberg, Florida Power and Light has emerged as one of the most efficient utilities in the country as evidenced by a recent award from the Electric Power Research

INSTITUTE. MR. HANSEL IS CHAIRMAN OF THE BOARD OF THE AMERICAN SOCIETY FOR QUALITY CONTROL, THE LARGEST ORGANIZATION IN THE FIELD AND THE CERTIFIER OF AMERICAN QUALITY CONTROL ENGINEERS.

OUR FINAL PANEL IS DRAWN PRIMARILY FROM EXPERTS IN COMPUTERS, AND ELECTRONICS. THIS AREA UNTIL RECENTLY HAS BEEN THE BRIGHTEST SUCCESS STORY IN AMERICAN EFFORTS TO INNOVATE AND COMPETE. OUR PANEL OF MR. CHOATE, MR. BEILMAN, AND MR. GARRY BRINGS US AN IMMENSE AMOUNT OF VISION AND PRACTICAL EXPERIENCE IN DEVELOPMENT OF NEW PRODUCTS AND THEIR INTRODUCTION INTO THE MARKETPLACE.

I LOOK FORWARD TO HEARING FROM EACH OF THESE WITNESSES.

OPENING STATEMENT
COMGRESSMAN SHERWOOD L. BOEHLERT (NY)
FOR
STRATEGIES FOR EXPLOITING U.S. TECHNOLOGY INNOVATION
JUNE 25, 1986

Mr. Chairman:

Today's hearings will concentrate on one particular aspect of economic competitiveness -- quality control.

It would be hard to overestimate the importance of this factor in determining our economic health. Just think of what has happened to the American auto industry as Americans have decided that foreign companies make better cars. That perception is likely to be a more persistent drag on industry performance than high gas or car prices ever could be.

We need to make the quality of American products and services a fact, not just a slogan. The creation of an award for quality control, as will be proposed today, would seem to be a step in the right direction. The Japanese have certainly had success with this approach.

I look forward to hearing how the establishment of an American equivalent of the Deming Prize could improve our economic success.

Thank you.

Mr. **Brown**. But in the interest of time, Dr. Compton, I think we probably ought to proceed with your testimony. And if you are flexible enough, we can interrupt you from time to time to take care of these other important and pressing matters. I would like to pay tribute to the work that the National Academy of Engineering has done and the excellent report and studies that they have made, and I am sure you will have some comments on that. It sometimes appears that this entire process of stewing in our juices and trying to figure out what is wrong with this country is rather fruitless. But I am inclined to be somewhat optimistic that we have succeeded in changing the threshold of understanding at least of the complexity of this problem, and perhaps setting the stage for some specific activities which will be constructive. And in fact, we have taken a few steps within the Government, within the Congress, which have been helpful, and there have also been major changes within the private sector which have been constructive. And in the long run I think these may lead us to being better able to solve our problems.

I am making these extemporaneous remarks hoping that Mr. Valentine will show up. Since he hasn't, however, and Mr. Fuqua has—I am stalling, Mr. Fuqua. Would you care to make any opening remarks?

Mr. **Fuqua**. Well, I am very glad to be here and glad that we are having these hearings on a subject matter that is of great interest to those of us in the Congress, and I think to the American public, as we try to further compete in the world marketplace. It is a subject that I don't think has any simple answers, but is certainly of great importance.

One of the witnesses today is a very good friend of mine, John Hudiburg, who is the chief executive officer of Florida Power & Light, which is the fifth largest publicly held utility in the country. And I might say during the summertime when I can get to Crescent Beach I am one of their ratepayers. But they have had a very successful business, and John has been in the forefront in his company in trying to address the issues that we're talking about here today.

We had a chance to visit with him in Japan earlier this year with some of the Japanese who had looked at some of these plans and have implemented them. They have been very effective not only in their business, but, also, have been adaptable to other businesses. So I'm looking forward to hearing more about it.

As you probably mentioned there's several hearings going on this morning, so some of us are traveling back and forth between the others. But I'm very glad to welcome my good friend John Hudiburg here this morning.

Mr. **Brown**. Well, he's not going to be our first witness, but——

Mr. **Fuqua**. No, I understand that.

Mr. **Brown** [continuing]. We will treat this introduction as if it had been made when he is called.

Mr. **Fuqua**. That's correct. That's correct.

Mr. **Brown**. We do appreciate you being here.

Dr. Compton, would you proceed with your statement, then?

STATEMENT OF W. DALE COMPTON, PH.D., SENIOR FELLOW, NATIONAL ACADEMY OF ENGINEERING, WASHINGTON, DC

Dr. COMPTON. Thank you very much, Congressman Brown, it's a pleasure to appear before you as a representative of the National Academy of Engineers. I will abbreviate somewhat the written statement that I have, and perhaps——

Mr. BROWN. The full text will be put in the record.

Dr. COMPTON. Let me just begin with a comment about the Academy complex. The Academies of Science and Engineering together with the Institute of Medicine were established as an advisory group to the Federal Government. Together they oversee the activities of the National Research Council where the bulk of the work of advising the Government takes place. These advisory functions are carried out principally in response to requests from Federal agencies or from the Congress for assessments and evaluations on problems of national importance involving science and technology.

Turning now to the National Academy of Engineering in particular——

Mr. BROWN. Would you hold up for just one moment, Dr. Compton?

Mr. Valentine, would you care to make a brief opening statement at this point?

Mr. VALENTINE. I would, Mr. Chairman. And we have, as is most always the case, other places to be, and I appreciate your affording me this opportunity.

I am delighted that our subcommittee, Mr. Chairman, is holding this series of hearings on strategies for exploiting American inventiveness in the world marketplace. I hope that this hearing will provide us with timely information that will assist the subcommittee in addressing one of this country's most critical needs: regaining and maintaining a competitive edge in technological advances in the world marketplace.

To assist our subcommittee in this effort, we have heard from and will continue to hear from experts in this field who have firsthand knowledge and information in this area. One of our distinguished panelists today is a gentleman I am pleased to introduce to the subcommittee. He is Mr. Don Beilman, president of the Microelectronics Center of North Carolina, and a constituent of mine. Mr. Beilman will share with us today his experience in the microelectronic industry and his innovative ideas as to how industry and Government could work together to implement new approaches which are critical to future U.S. economic leadership.

Mr. Beilman, we look forward to receiving your testimony. And let me also say that we are very pleased that you have taken time from a busy schedule to be with us and to share your perspectives on this issue. For the subcommittee members and for myself, I thank you very much.

And I thank you, Mr. Chairman.

Mr. BROWN. Thank you, Mr. Valentine. And to demonstrate the great capabilities of the subcommittee, when the final hearing record is printed, it will appear that you made that statement at exactly the right point in the record and everything will work out just fine, then.

Now, would you continue, Dr. Compton?

Dr. COMPTON. Turning now to a brief word about the National Academy of Engineering in particular, it has focused throughout its 22-year history, upon the problems of engineering and technology. In its capacity as an advisor to the Government it has responded to numerous requests for counsel on specific topics. And it will, of course, continue to do this by calling upon its members to come together to provide expert opinion and advice on specific technological issues that are under consideration by any of a variety of units of our Government. The expertise of the NAE membership in creating and managing technology and the Academy relationship with individuals and organizations in industry and academia provide the NAE with unique advantages.

Recently, however, the Academy has initiated a broader investigation of the issues that relate technology and our national wellbeing. We have developed an effort, supported in part by independent funds, whose perspective is broader than that which could be accomplished while responding only to individual requests for specific studies. We call this the National Academy of Engineering Technological Leadership Program. This will be a long-term continuing effort with support being provided by the private sector, including industry, foundations, and individuals and Government agencies.

It is worth noting that support from the private sector has been provided in the form of unrestricted grants as opposed to the funding of specific projects. Thus, the Academy has a degree of flexibility in the choosing of topics and in the exploration of new ideas.

The broad objectives of the Technological Leadership Program are to enhance industrial competitiveness, stimulate economic growth, and enhance the general welfare of the populace through the improved utilization of technology. These can be made a bit more explicit by noting that we intend to foster manufacturing excellence, assist industry in adapting to globalization, support economic growth by strengthening institutions for engineering leadership, foster innovative technologies, enhance job creation, improve the safety and reliability of the workplace, strengthen engineering education, and improve the public understanding of the importance of engineering and technology.

Now a couple of examples, if I might. The Academy's program in industrial competitiveness was initiated with a study of the competitive status of seven major industrial sectors; namely, automotive, machine tools electronics, pharmaceuticals, aviation, fibers and textiles, and steel. Although these industries have many unique features in their products and in the processes employed, they were found to share one characteristic, namely, to be competitive they must improve the efficiency of their manufacturing operations. We believe that this characteristic is not only true of these seven, but that it can be generalized. It is our conviction that the productivity of our manufacturing establishments must be significantly improved if this Nation is to successfully compete in the international marketplace.

In approaching this more general topic of manufacturing productivity, our program has initiated a series of studies that are expected to identify the technical opportunities for substantially improving the productive capacity and capability of new or existing manufacturing facilities; the conflicts that exist that may hamper our capability to improve our manufacturing efficiencies; and, finally, a variety of issues that confront the industrial sector as it evolves from the national economic perspective to that of an international perspective.

Now, as an example of the technical opportunities that exist to improve manufacturing efficiencies, let me just comment that I am sure you have visited a large manufacturing facility and I am sure you have been impressed with the number of computers that you see in those facilities. And I think it is obvious to everyone that the computer has become the tool of the manufacturer. What is not so obvious, however, is how the designer of a modern manufacturing facility decides where to use those computers, how to connect them, where to send the information that they generate, and how to interface them with the humans who ultimately keep the place running.

It is, unfortunately, true that the tools do not yet exist to describe analytically the workings of a large complex manufacturing facility. Many facilities are simply too complex to allow a mathematical description of them with the tools currently available. There is simply no way to analytically demonstrate that a particular design is optimal from the point of view of flexibility or unit cost or even unit return on investment. And without a mathematical description, which to the computer specialist means a set of algorithms, the plant designer and operator are forced to rely on intuition and experience. And it's also, therefore, true that if the tools are not available for design, they are not available for control on a day-to-day basis.

The Academy believes that this represents both a deficiency and an opportunity. We will be bringing together the research community from industry, Government, and the universities to exchange views on this topic, to identify research opportunities, and to search for more common research objectives as we attempt to improve our national capability in this arena.

The results of these efforts will be made available to all research people through publications of the technical proceedings. They will also be made available to policymakers, both public and private, through an abbreviated summary that will contain not only the technical conclusions but also the recommendations for future actions.

A second example will illustrate some of our efforts to deal with the technical capability of other elements of our industry. Whereas the effects of new technologies in the manufacturing industries have been explored in the last few years, the role of new technologies in the service industries is less well appreciated. An important component of technological change in the service industries is the impact of information technology on services like finance, media, retailing, and education.

A major symposium is being planned that will address a number of issues in the service industries. What are the sources of technological advance in these various industries? What is the relationship between services and manufacturing, and how are service technologies changing the nature of manufacturing? What have been the primary impacts of service technologies on international trade in services, and what are the likely future directions for this? What potentials do technologies provide for productivity gains and entrepreneurship in the service sector?

These are but two examples of detailed studies that are underway. We recognize, of course, that simply doing a study or having a workshop is not sufficient to alter the course of events. The results of the studies, the workshops, and the symposia must be communicated effectively to the people who are responsible for policies. And this is done through the involvement of many people in the workshops, in the symposia, and through the wide dissemination of the publications that result from these meetings.

I have with me here a couple of those publications which I will leave with you after the hearing, and I will refer to them again later in the testimony.

Another means of accomplishing this dissemination is currently being examined. We are developing plans for a Manufacturing Forum, the purpose of which will be to provide an open environment where leaders of Government, industry, labor, and the universities can meet to discuss the technical, financial, legal and human issues that surround our capability to compete in the world marketplace. It is our expectation that the organizational details surrounding the formation of this Forum will be completed by late this year.

Turning now to engineering education. As technology becomes ever more complex and its uses ever more demanding, the capability of the workforce to develop it and to use it becomes more critical. An important aspect of the Technological Leadership Program is a concern with technical education. And this concern begins with the mathematics and science training in the elementary schools, extends through the college level, both graduate and undergraduate, and concludes with the needs that exist for lifelong competency in technology.

And I must emphasize that we view technical literacy of the total population to be of critical importance to this Nation. This does not say that everyone needs an understanding of the technical details, but an appreciation of the implications and limitations of technology is essential.

The Technological Leadership Program is supporting a major study on the needs for lifelong competence in engineering. Few, if any, engineers will acquire all the knowledge and skills that they will need during their initial education. The acquisition of knowledge and skills on the job and through continuing lifelong education is essential. The Academy activity will strive to foster lifelong competence in the U.S. engineering community, for those in industry as well as in the formal educational environment. As the needs of industry change, the employed worker must be capable of adjusting. Lifelong education will become a more central requirement for assuring lifelong employment.

With regard to the educational environment, the lifelong education of faculty will be stressed. In one aspect of this study, we will examine the possibility of a larger potential role for industry in assisting in this faculty education process.

As a final item in this discussion of the details of our program, I call your attention to a series of symposia that have been held to explore the social implications that accompany many of our technical developments. Titles of these are Education for the Manufacturing World of the Future, Information Technologies and Social Transformation, Economics and Technology, and Hazards: Technology and Fairness.

The Economics and Technology symposia featured a discourse among the practitioners of economics and of technology. An important result of that discourse has been the publication and wide distribution of the book The Positive Sum Strategy—Harnessing Technology for Economic Growth, edited by Drs. Landau and Rosenberg. I think perhaps you have a copy of this Congressman.

The symposium on Hazards: Technology and Fairness was concerned with environmental needs and resources. And coming just after the Bhopal tragedy, it brought together members of the academic, industrial, legal, and public-sector communities with expertise in the management of technological hazards. The topics of that symposium were the management of low-level or low-probability hazards when scientific evidence of causation is uncertain; the equitable distribution of the costs and benefits of potentially hazardous technologies; and the management of technological hazards in the face of conflicting scientific, ethical, and constituency claims. And that resulted in this publication.

As a result of this brief description, I hope you will have some appreciation of the Academy program. It is structured in such a way that it touches the specific needs for new technology, on how technology is used, on the social implications of these new developments, on the human resources that are needed and the needs that they have for an ever increasing level and content of educational training.

We believe that the program is responsive to the request expressed in President Reagan's letter of March 1985, in which he asked the National Academy of Engineering to join with other technical organizations to "martial the nation's technical engineering-based expertise in a campaign that will ensure America's scientific, technological and engineering leadership in the 21st century."

I would like to conclude with one comment about the context in which we judge the value of technology. Technology is of modest value when it is not being applied, when it is on the shelf, so to speak. But the willingness and ability to apply technology aggressively improves markedly when the many other elements of our economic system are equitable, when they are stable, and when they are predictable. Technology can be a more effective tool for development when our economic system is healthy and strong. And it is essential that we continue to strive for this constant improvement in the climate, in our economic climate, as we seek to develop and use technology for the betterment of society.

Congressman, thank you. It's a pleasure to be here with you. And I will leave these volumes with you after the hearing.

[The prepared statement of Dr. Compton follows:]

TESTIMONY BEFORE THE U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE AND TECHNOLOGY
SUBCOMMITTEE ON SCIENCE, RESEARCH, AND TECHNOLOGY

by
W. DALE COMPTON
SENIOR FELLOW, NATIONAL ACADEMY OF ENGINEERING
JUNE 25, 1986

I can well imagine that this Subcommittee has heard essentially every concern that might be voiced regarding the health of this nation's science and technology enterprise. Many of those concerns are legitimate, serious, and demand our collective attention if this nation is to maintain its pre-eminence. I will not attempt to justify further the implication of that last statement, namely, the vital importance of science and technology to our nation. The willingness of the various units of the Committee on Science and Technology to devote so much attention to this topic clearly suggests that you need no convincing.

The National Academy of Engineering, throughout its 22 year history, has focussed upon the problems of engineering and technology. In its capacity as an advisor to the government, it has responded to numerous requests for counsel on specific topics. And it will, of course, continue to do this by calling upon its members to come together to provide expert opinion and advice on specific technological issues that are under consideration by a unit of our government. The expertise of the NAE membership in creating and managing technology and the Academy relationship with individuals and organizations in industry and academia provide the NAE with unique advantages.

Recently, however, the Academy has initiated a broader investigation of the issues that relate technology and our national well-being. We have developed an effort, supported in part by independent funds, whose perspective is broader than that which could be accomplished while responding only to individual requests for specific studies. We call this the National Academy of Engineering Technological Leadership Program. This will be a long-term continuing effort with support being provided by the private sector, including industry, foundations, and individuals, and government agencies. It is worth noting that the support from the private sector has been provided in the form of unrestricted grants as opposed to the funding of specific projects. Thus, the Academy has a degree of flexibility in the choosing of topics and the exploration of new areas.

The broad objectives of the Technological Leadership Program are to enhance industrial competitiveness, stimulate economic growth and enhance the general welfare of the populace through the improved utilization of technology. These can be made a bit more explicit by noting that we intend to:

foster manufacturing excellence,

assist industry in adapting to globalization,

support economic growth by strengthening institutions for engineering leadership,

foster innovative technologies,

enhance job creation,

improve the safety and reliability of the work-place,

strengthen engineering education, and

improve the public understanding of the importance of engineering and technology.

A few examples will serve to illustrate better the specifics of the plans.

Industrial Competitiveness

The Academy's program in industrial competitiveness was initiated with a study of the competitive status of seven major industrial sectors, namely, automotive, machine tools, electronics, pharmaceuticals, aviation, fibers and textiles, and steel. Although these industries have many unique features in their products and in the processes employed, they were found to share one characteristic, namely to be competitive they must improve the efficiency of their manufacturing operations. We believe that this characteristic is not only true for these seven industries but that it can be generalized. It is our conviction that the productivity of our manufacturing establishments must be significantly improved if this nation is to successfully compete in the international market-place.

In approaching this more general topic of manufacturing productivity, the Technological Leadership Program has initiated a series of studies that are expected to identify:

technical opportunities for substantially improving the productive capability of new or existing manufacturing facilities,

conflicts that exist that may hamper our capability to improve our manufacturing efficiencies, and

various issues that confront the industrial sector as it evolves from the national economic perspective to an international perspective.

You may find an example of the first of these, the technical opportunities to improve our manufacturing efficiencies, to be of particular interest. Most of you have visited a large manufacturing facility. I can imagine that you were struck, as I have always been, with the number of computers that you see in these modern facilities. It is obvious that the computer has become the tool of the manufacturer. What is not so obvious, however, is how the designer of a modern manufacturing facility decides where to use those computers, how to connect them, where to send the information that they generate, and how to interface them with the humans who ultimately keep the place running.

It is true, unfortunately, that the tools do not yet exist to describe analytically the workings of a large complex manufacturing facility. Many plants are simply too complex to allow a mathematical description of them with the tools currently available. There is simply no way to analytically demonstrate that a particular design is optimal from the point of view of flexibility, or unit cost, or unit return on investment. And without a mathematical description, which to the computer specialist means a set of algorithms, the plant designer and operator are forced to rely on intuition and experience. And if the tools are not available for design, they are also not available for day-to-day control.

The Academy believes that this represents both a deficiency and an opportunity. We will be bringing together the research community, from industry, government, and the universities, to exchange views on this topic, to identify research opportunities, and to search for more common research objectives as we attempt to improve our national capability. The results of this effort will be made available to all research people through publication of the technical proceedings of the symposium. It will also be made avaiable to policy-makers, both public and private, through an abbreviated summary that will contain both the technical conclusions of the symposium and the recommendations for future actions that will be developed during the meeting.

Another example will illustrate some of the other efforts to deal with the technical capabilty of our industry. Whereas the effects of new technologies in the manufacturing industries have been explored in the last few years, the role of new technologies in the service industries is less well appreciated. An important component of technological change in the services industries is the impact of information technology on services like finance, media, retailing, and education. Information technologies are not, however, the only technologies causing dramatic change in service industries. Other examples include the way that advances in medical devices and drugs are changing the delivery of medical services and the way advances in aircraft design and construction are changing the air travel industry.

A major symposium is being planned that will address the following issues:

What are the sources of technological advance in various services industries?

What is the relationship between services and manufacturing and how are service technologies changing the nature of manufacturing?

What have been the primary impacts of services technologies on international trade in services and what are the likely future directions for trade in services?

What potentials do technologies provide for productivity gains and entrepreneurship in the services sector?

These are but two examples of detailed studies that are underway. We recognize, of course, that simply doing a study or having a workshop is not sufficient to alter the course of events. The results of the studies, the workshops, and the symposia must be communicated effectively to the people who are responsible for policy. This is done through the involvement of many people in the work-shops and the symposia and through the wide dissemination of the publications that result from these meetings. Another means of accomplishing this is currently being examined. We are developing plans for a Manufacturing Forum, the purpose of which will be to provide an open environment where leaders of government, industry, labor, and the universities can meet to discuss the technical, financial, legal and human issues that surround our capabilty to compete in the world market-place. It is our expectation that the organizational details surrounding the formation of this Forum will be complated by the late fall of this year.

Engineering Education

As technology becomes ever more complex and its uses ever more demanding, the capability of the work-force to develop it and to use it becomes more critical. An important aspect of the Technological Leadership Program is the concern with technical education. This concern begins with mathematics and science training in the elementary schools, extends through the college-level, both undergraduate and graduate, and concludes with the needs that exist for lifelong competency in technology. Before describing more completely our program plans in technical education, I must emphasize that we view technical literacy of the total population to be of critical importance to this nation. Without an appreciation of the social, economic, and human aspects of technology, it is increasingly difficult to arrive at a sensible national consensus on matters that involve technical issues. This is not to say that everyone needs an understanding of the technical details, but an appreciation of the implications and the limitations of technology is essential.

The rich diversity and pluralism of the American engineering education enterprise provide multiple paths to engineering careers. This factor must be taken into full account in reaching judgments on the adequacy and quality of the enterprise as a whole and in charting the course for its future progress. Corporate education is now comparable to university-based education in both the number of students and the amount of resources employed. But structured continuing education is only 5% of the total continuing education effort.

The Technological Leadership Program is supporting a major study on the needs for Lifelong Competence in Engineering. Few, if any, engineers will acquire all of the knowledge and skills that they will need during their initial education. The acquisition of knowledge and skills on the job and through continuing lifelong education is essential. The Academy activity will strive to foster lifelong competence in the U.S. engineering community, for those in industry as well as in the formal educational environment. As the needs of industry change, the employed worker must be capable of adjusting. Lifelong education will become a more central requirement for assuring lifelong employment. With regard to the educational environment, the lifelong education of faculty will be stressed. In one aspect of this study we will examine the possibility of a larger potential role for industry in faculty education. Integral to this is an effort to better understand the rate of obsolescence of education for engineering practice and instruction.

Technology and the General Welfare

As a final item in this discussion of the details of the Technological Leadership Program, I call your attention to a series of Symposia that have been held to explore the social implications that accompany many of our technical developments. The titles of four of these Symposia are:

Education for the Manufacturing World of the Future

Information Technologies and Social Transformation

Economics and Technology

Hazards: Technology and Fairness

The Economics and Technology Symposium featured a discourse among the practitioners of economics and of technology. An important result of that discourse has been the publication and wide distribution of the book "The Positive Sum Strategy--Harnessing Technology for Economic Growth," edited by Ralph Landau and Nathan Rosenberg. We believe that it is making a significant contribution to the undestanding of this important topic.

The symposium on Hazards: Technology and Fairness was concerned with environmental needs and resources. Coming just after the Bhopal tragedy, it brought together members of the academic, industrial, legal, and public-sector communities with expertise in the management of technological hazards. The topics of the symposium were:

the management of low-level or low-probability hazards when scientific evidence of causation is uncertain,

the equitable distribution of the costs and benefits of potentially hazardous technologies, and

the management of technological hazards in the face of conflicting scientific, ethical, and constituency claims.

As a result of this brief description, I hope that you have some appreciation for the Academy program. It is structured in such a way that it touches on the specific needs for new technology, on how technology is used, on the social implications of these new developments, on the human resources that are needed and the needs that they have for an ever increasing level and content of educational training.

We believe that this program is responsive to the request expressed in President Reagan's letter of March, 1985, in which he asked that the National Academy of Engineering join with other technical organizations to "----martial the nation's technical engineering-based expertise in a campaign that will ensure America's scientific, technological and engineering leadership into the 21st Century.-----These efforts to strengthen the nation's engineering and technology capabilities are essential to the goal of helping American businesses and workers to modernize and compete. We must also press forward in the use of our engineering and technological strengths to provide for the health and safety of the working and natural environment.----"

I would like to conclude with one comment about the context in which we judge the value of technology. Technology is of modest value when it is not being applied, when it is on the shelf, so to speak. But the willingness and ability to apply technology aggressively improves markedly when the many other elements of our economic system are equitable, stable and predictable. Technology can be a more effective tool for development when our economic system is healthy and strong. It is essential that we continue to strive for this constant improvement in our economic climate as we seek to develop and use technology for the betterment of society.

Mr. **Brown**. Thank you very much, Dr. Compton.

I think the Academy has, indeed, made an adequate and positive response to the call of the President for getting involved and harnessing our resources to meet this need, and I commend the Academy for doing that.

Can you give me your own personal evaluation as to the impact, both present and anticipated future, of the Academy's activities in terms of resolving some of these problems? The Technological Leadership Program, for example, how much is that going to achieve? How long are you going to be able to continue working on it? How much cooperation have the other professional societies, and there are many who have active programs in this area—is the combination of all of these going to have a measurable effect on solving the problem, which I think we are all aware of in its broad outline?

Dr. **Compton**. If I might address the timing first. We view this as a long-term program. The resources are available to carry out these studies and to address the topics as is needed over a long period of time. And we really view this as a—we have the capability of continuing this for several years in the future.

The cooperation between the Academy and the other technical societies are excellent. We make an intense effort not to duplicate efforts that are underway in the other societies, nor efforts that are more appropriately carried out within a particular technical discipline represented by those other societies. Our own effort needs to be more of an umbrella effort overlaying those where there may be interactions between the societies that are necessary.

Now turning to your question of the value of this and whether one can really affect policy and affect the solution of the problems. I think one can take two views of the role of the Academy, Mr. Brown. One is a contributor to the literature in which one is trying to just improve the understanding of topics and what the various issues are. And that I think the Academy has been quite effective in. It has carried on a number of significant studies and the publications from those are widely available and I believe are used quite importantly.

The degree to which the academy can be effective as an action-oriented agency or a group, however, is not so clear. We are, in fact, a professional society. We are, in fact, chartered as an advisory group to the Federal Government. And I think the potential for improving our effectiveness comes from defining with the Federal Government and the important agencies and the Congress those topics which are current for which we can help them as they lead—as they move forward to adopt policies and strategies. So an earlier identification of mutual interests and capabilities is probably our greatest asset in terms of helping you as you are trying to do your own job.

Mr. **Brown**. Well, a proper sense of humility is appropriate for all of us working on this problem. In a huge, complex social and economic system such as we have, the ability of any one actor to make a massive change is rather limited. However, the net impact of all of our efforts can only be effective if it has some sort of a guiding principle and common understanding of what we are trying to do, and then we each make our contribution. If you ever get frustrated at the academy, you can imagine how we feel in Congress.

You recall the effort that we made to improve the national science and technology literacy situation to upgrade the understanding of the general public of technological needs back after Sputnik. We thought we had a good program. And it turns out that it was—it achieved some temporary good but it didn't have the lasting impact that we wanted to have. Maybe because of a lack of adequate followthrough, who knows? But that is frustrating. And I'm sure that others feel the same way as they see their own efforts hard to measure in terms of what the ultimate results are.

But if we—if all of the professional organizations that fall within the purview of the Academy of Engineering are working toward a common goal with some sort of a sense of what the program is, it's going to have an impact. And that's just what we want to encourage.

I've frequently mentioned with approval the example of the National Society of Professional Engineers' efforts to improve mathematics literacy in this country through sponsoring of competitive mathematics activity around the country and so on. We need—we need to stimulate a great deal of that kind of thing, and it will be very beneficial.

I have to ask you one additional question that relates to any opinions you mght have about what the Federal Government might be able to do. And again we run up against the problem, of course, that the President properly recognizes, that there are limits to the Federal role; that we can't solve everybody's problems and that we shouldn't even try to operate on a basis of some sort of a centralized mandate to do this or to do that. But there has been over the years frequent recommendations, most lately embodied in the Young report, that we ought to reorganize the Federal structure for coordination of our scientific and technological activities. They proposed a Department of Science and Technology, and that's only the latest in a long series of recommendations.

Do you have, or does the Academy have any views as to whether there is a need to improve the role of the Federal Government in terms of coordinating its own science and technology policy activities?

Dr. COMPTON. I will offer you my personal view on that, Mr. Brown. I think I'd rather not attempt to speak on behalf of the Academy for this.

Mr. BROWN. You don't speak for the Academy, I won't speak for Congress. [Laughter.]

Dr. COMPTON. I think clearly there is a need for improving the coordination, the communication, and the processes used in the adoption of programs, of how those programs are administered, how they are implemented. It is not so clear to me that the establishment of a Department of Science is the optimal way of going about that. But clearly there are some things that we could—that I would think need to be considered to have a more effective use of the enormous resources that the Federal Government is putting into science and technology.

We probably need to consider some experiments in terms of how to bring people together in a way that allows consensus judgments to be developed in terms of where are our priorities. I'm not so clear, though, that that is most effectively done through a single department. Maybe some department can be a stimulant for it, but widespread consensus is something that I think of all of the differences in the Japanese and the American system I would point to as perhaps one of the most important. Once that consensus is developed lots of people can help move it along. We have a deficiency in the mechanisms of doing that in this country.

Mr. **Brown**. The—I'm always reminded of Vanderbilt Bush's efforts to achieve this same goal of better coordination of the Federal role. And his proposal originally called for a National Research Institute that would include all of the research then being done in the Department of Defense and what we now call the Institutes of Health, as well as the development of what we now call the National Science Foundation for supporting university research. I don't know whether he was disappointed or not that after 5 years we finally adopted the National Science Foundation, which accomplished only a part of what he had sought to do.

And I'm not sure he was right in seeking to do that. I would not today seek to put together defense and health and all of the other things that we're doing, although I might want to take a smaller bite of the apple if it appeared possible to do so from a political standpoint.

Well, we very much appreciate your testimony, Dr. Compton, and the work that the Academy has been doing. And we will look forward to continued communication with you, so, if nothing else, we can ensure that we are all working in some sort of a common mode to achieve the purposes here. Sometimes in my more optimistic moments I think that we may succeed despite all of our failures and help to solve the problem the country faces.

Dr. **Compton**. We share your optimism, sir. And thank you.

Mr. **Brown**. Thank you.

I am going to call the next three witnesses as a panel: Dr. Joseph Juran, who is chairman of the Juran Institute; Dr. John Hudiburg, CEO, Florida Power & Light, who has already been introduced by our distinguished chairman; and Mr. John L. Hansel, chairman of the board, the American Society for Quality Control.

We certainly do appreciate the presence of all of you distinguished gentlemen. Dr. Juran, I have difficulty comprehending how long you've been involved in the efforts that we're seeing such a high priority on today.

Dr. **Juran**. I have more difficulty than you do, Mr. Chairman. [Laughter.]

Mr. **Brown**. To say the least, you were ahead of your time, but now the times are catching up with you.

Would you like to proceed, Dr. Juran?

STATEMENTS OF DR. JOSEPH M. JURAN, CHAIRMAN, JURAN INSTITUTE, INC., WILTON, CT; JOHN J. HUDIBURG, CHIEF EXECUTIVE OFFICER, FLORIDA POWER & LIGHT CO., MIAMI, FL; JOHN L. HANSEL, CHAIRMAN OF THE BOARD, AMERICAN SOCIETY FOR QUALITY CONTROL, WASHINGTON, DC

Dr. JURAN. Thank you, Mr. Chairman. My name is Joseph Juran. I'm chairman of Juran Institute, an educational organization which provides training and consulting services relative to product quality.

I have been associated with the subject of quality ever since 1924, first as engineer and manager in the Bell System, and since 1945, as an author, teacher and consultant.

In this field of quality I have authored the international reference works and textbooks. I have also developed the pioneering training courses for managers, and have conducted such training in about 40 countries around the world.

The central fact about quality of goods and services is that until several decades ago we in the U.S.A. were among the world leaders in quality. That leadership provided us with a broad market for our products, in exports as well as domestically. In turn, the marketability of our products created jobs. It also contributed to favorable trade balances.

In the last several decades we have lost our quality leadership in many important product lines: Automobiles, steel, cameras, consumer electronics—to name a few. Our loss of quality leadership has already cost us millions of jobs and tens of billions of dollars in trade balances. The end of such losses is not yet in sight because our impacted companies still have a great deal of catchup ahead of them.

During those same decades, quality leadership in many product lines has passed to Japan, a country whose quality reputation had been one of the worst. It is not that our quality has gotten worse. On the contrary, we have improved steadily, though at a slow pace. However, during those decades the Japanese have revolutionized their quality at a pace which has no precedent in industrial history.

The Japanese have carried out their quality revolution through a variety of means, principally top management's personal leadership of the quality revolution, the top people took personal charge; extensive training throughout the companies in how to plan, control, and improve quality; and a revolutionary rate of improvement of quality year after year.

This revolution was mainly carried out by the industrial companies in their own self-interest. At first they brought their quality up to levels which made their goods salable in world markets. Then they improved their quality to competitive and leadership levels, thereby increasing their share of market and securing premium prices while reducing the wastes and the costs due to poor quality.

Let me interject, Mr. Chairman, those wastes and costs due to poor quality represent about a third of our economy. About a third of what we do is doing over again what wasn't properly done.

Our loss of quality leadership has put us in a state of crisis with respect to product quality. It is a crisis of national proportions, and it will be with us minimally for the rest of the century.

To get out of this crisis, we must create our own quality revolution. That revolution will have to be tailored to fit our American culture, but in any case the major action must take place within the companies and it must include the fundamental steps taken by the Japanese: Top management's personal leadership of the quality revolution; extensive training throughout the companies in how to plan, control, and improve quality; and a revolutionary rate of improvement in quality year after year.

Let me mention also, Mr. Chairman, we have on the panel an example of a company that has done exactly that: Florida Power & Light.

In hearings such as this the legislators invariably ask "What can government do to help?"

A number of countries have at various times tried to mount a national effort aimed at stimulating quality improvement. These countries have included Great Britain, the Netherlands, Czechoslovakia, France, the Soviet Union, and others. On such occasions the national governments have employed various tools to help the economy. These tools have included a widely publicized national campaign, such as "National Quality Year"—such a campaign is sponsored by recognized national leaders; conduct of national and regional conferences to arouse interest and stimulate action; preparation of training materials and conduct of training courses; legislation providing tax concessions for training activities relative to improvement of quality; legislation to control quality of goods intended for export—that is widely used in developing countries; establishment of prizes for outstanding designs of products; establishment of awards to be made to companies for high quality attainment; creation of independent consumer product test laboratories, and publicizing the test results on national television.

In my experience, these national efforts have mostly come and gone without accomplishing much in tangible results. I suspect that here in the U.S.A. a national effort based on use of similar tools would similarly come and go without getting much in tangible results. However, the idea of a national award to recognize companies for high quality attainment might well be an exception.

The Japanese have such an award, but it is not sponsored by the national government. Instead, it is sponsored by the Japanese Union of Scientists and Engineers [JUSE]. JUSE is a professional, nonprofit society whose activities are mainly quality oriented. It sponsors numerous training programs and conferences, and publishes many books and journals. Through these and other activities it has earned a status as the quality center of Japan.

JUSE also sponsors the Deming Prize. The prize is awarded annually to one or several organizations whose products and processes are deemed to meet the criteria set up for the prize. The judging is done by a team of specialists appointed by JUSE. This prize, first established in 1951, has acquired increasing stature over the years. The main reason is advertising. Companies which receive the Deming Prize are permitted to publicize the event. They do this on a large scale, on billboards, in journals, and so on. I might say the picture of Dr. Deming is seen more widely in Japan than the picture of any Japanese. This same publicity has raised the visibility of the Deming Prize to a point that it has acquired national and international prestige. In turn, this prestige has become a stimulus to companies to organize their affairs in ways which can enable them to qualify for the prize.

It would be useful to our economy to establish a prize which, in due course, would earn national recognition as evidence of high attainment in quality. Creation of such a prize requires meeting some essential conditions: Sponsorship by a respected nonprofit organization, agreed criteria for judging high attainment in quality, and an independent body of qualified judges.

I must note, however, that our National Government is in many quarters not highly regarded as to the conduct of its affairs relative to quality. For example, the Government is a huge buyer of goods and services. In making these purchases, it does give consideration to quality, but the contracts are mainly awarded to the lowest bidder.

My own conviction is that the competitive marketplace will be the prime means of stimulating our companies to regain their quality leadership. Marketplace competition was the force which created the Japanese quality revolution. Their companies were forced to improve their quality in order to be able to sell their products.

As a corollary, I believe that the Government can help mainly by providing a climate in which the competitive marketplace can function freely and naturally. To a considerable degree, this climate is in place now, but it can be improved in a number of ways. As a large provider of services, the Government can take steps to improve the quality of those services and thereby set an example; be a leader, not just a cheerleader. As a large purchaser of goods and services, the Government can take positive steps to increase the priority given to quality. As a regulator of industry, the Government can take steps to reduce the adversary relationship which has prevailed in recent years. And as a legislator for social reform, the Government can re-examine the impact of such legislation on product quality.

That is the end of my prepared statement, Mr. Chairman, and I will be glad to respond to questions.

Mr. **Brown**. Thank you very much, Dr. Juran. That's an impressive statement and we very much appreciate it.

I'm going to ask the other two members of the panel to make their statements, and then we'll ask some questions of all three of you.

Mr. Hudiburg, I guess you're next. And everyone's been referring to the great work that you've been doing. You've given the kind of leadership which seems to be an indispensable ingredient, and we're looking forward to you telling us exactly how you do that. You may proceed.

Mr. **Hudiburg**. Thank you, Mr. Chairman. It's a pleasure to be here today along with others who share our common vision to talk about quality of American goods and services and the concept of an award for outstanding implementation of corporate quality programs.

American quality. It sort of has a ring of historic precedent, but somewhere along the line, as we've noted, the United States, in many instances, reduced that concept to just rhetoric. Unlike Lady Liberty, we have no monument to American quality. But I feel we need to build one to give a similar level of reverence if we intend to recapture our competitive standing in the world marketplace. And I believe a legislative effort is the best, perhaps the only way to accomplish the goal of giving it lasting and meaningful esteem.

Before we take up that possibility, allow me to provide a little background, a few examples of how quality works at my company, and a brief status report on the state-of-the-management science of quality improvement in business today.

With all due respect to those who had the foresight to recognize a good thing, embrace it, and make it work for their advantage, the concept of quality control was not invented in Japan. I have a great deal of respect for the Japanese total quality control system; however, the basic idea for this system was conceived in the United States by men like Edward Deming and Dr. Juran, at my right, and, frankly, exported for lack of interest at home—manufactured in Japan—and when it met with such overwhelming success was returned to the United States as an import.

Thanks to the success of the Japanese, quality improvement programs have become a proven business strategy. Recognizing that American products were being overwhelmed by foreign competitors, major U.S. corporations began adopting similar programs in the 1970's and 1980's. As a result, customer-oriented management/quality management processes were rejuvenated in the United States, and American knowhow was applied to improve and refine the process. Or, as Winston Churchill once noted, "Americans can always be counted on to do the right thing, but only after they have tried everything else." So today, many of the Nation's businesses and industries are hard at work on programs designed to bring about a renaissance of American quality.

The incentive for quality improvement programs is great for a number of reasons. For example, the Commerce Department's most recent estimates suggest that some 70 of all American-manufactured products are either current or prospective targets for foreign competition. At Florida Power & Light, for example, our quality improvement program has moved beyond the quality circles concept, or as we refer to them, quality improvement teams, to a phase we call policy deployment.

The team or circle concept, if you're not familiar with it, brings employees together to discuss problems and opportunities of their own choosing. This beginning phase also provides employees with a formal process for determining the steps that can be taken to solve the problem or to make the most of the opportunity and, more importantly, it provides them with a process for management approval and implementation of their idea. I can tell you that the results of this type of approach are phenomenal.

Our employees have been very enthusiastic about the team concept from the beginning. Today, we have more than 1,700 QIP teams companywide. That's 8,000 of our employees, or more than 60 percent of our work force, thinking about, talking about, and doing something about quality.

Our quality improvement teams have come up with thousands of problem solutions. And I will illustrate the wide span of solutions with just two examples: An interoffice mail procedure that achieved a 93-percent reduction in incorrectly addressed mail and the resulting overtime to correct that problem, and a record-setting 38-day refueling of our St. Lucie Nuclear Power Plant in about half the normal time for us and 10 days faster than Florida Power & Light's previous record.

The second phase of our quality improvement program is called policy deployment. It's equally important, as it provides us with a structure for communicating management direction and setting strategic objectives, and developing projects to meet those objectives. At Florida Power & Light it is a process where breakthroughs on a few selected issues are achieved through concentrated organizational efforts and resources.

And last year, we introduced the third and final phase of our total quality effort called quality in daily work. The key to quality in daily work for our people is to learn and utilize the proven problem-solving techniques of our quality improvement program, and then apply them to their everyday work.

This month Florida Power & Light was awarded the Edison Award by the Edison Electric Institute. I'm sure that this award will go a long way toward perpetuating the enthusiasm of our people and what they feel about the program and the results that they know they can earn.

While our goal is quality, the true test for Florida Power & Light, and for others, will be customer satisfaction.

All of this is by way of saying that American industry, Florida Power & Light included, is beginning to understand that improved quality in goods and services and improved productivity go hand in hand. A commitment to excellence in manufacturing and services is essential for the well-being of the U.S. economy and our society.

We believe that a national quality award would help stimulate this process for the pride of recognition and for the resulting competitive edge of greater profitability.

We also believe that everyone—winners, near winners, and beginners—will benefit from the existence of a national award program I would propose. Criteria, once published, can serve as a benchmark, as well as a hallmark, for achievement. In Japan, as has been noted here this morning, the Deming Prize for outstanding statistical quality control contributions is the most prestigious achievement a company can earn. A close look at its objectives has provided us with an understanding of what our award must consist of if it is to be equally meaningful.

Number one: It must be prestigious.

To achieve the maximum prestige, the award should be limited to just a few a year and should be presented by the President. And while I believe the President should be the presenter, clear direction from Congress, via legislation, will ensure that the award will be continued regardless of the policies of future administrations.

Number two: It should be self-funding.

A funding foundation should be established. Moreover, I think public acceptance would be greater if the companies applying for the award foot the bill for the consulting services of the evaluators or judges, rather than the taxpayer.

Number three, and maybe most important: It should be earned.

By that I mean the criteria must be rigorous, requiring not only a written response to published criteria, but also a site validation visit by a panel of qualified judges.

In order to meet these three important "musts," the entire program must also be administered by a body designated by the legislature.

There exists today a number of organizations established to serve the Nation's industries as quality program consultants, including the American Society of Quality Control, the Juran Institute, the American Productivity Center, and a number of others. Their contributions to our progress is immeasurable and their willingness to administer, and even help fund the award, is both generous and logical.

However, I believe a government commission should be established to set policy for the award. It could select one of these other quality groups to administer the award. And this joint effort, or committee, could best determine the criterion for the award and the judges, and oversee the administration of the funding. My personal opinion is that the appropriate organization exists in the American Society for Quality Control; however, the commission could make that determination later.

Most major U.S. corporations are active in the ASQC, and while members of the Juran Institute, the American Productivity Center, and others, maintain ties to it.

Mr. Chairman, I'd like to see the phrase "they just don't make them like they used to" disappear from the American vocabulary. Over the years, consumers have uttered those words more and more as American products seemed to offer less and less in terms of quality. But for those who think care and craftsmanship went out with the Frigidaire and back with the Toyota, there is good news. I am absolutely convinced that times are changing and so is the attitude toward quality in America. The truth is in most cases Americans are probably making things better than they used to. The pride of "Made in America" is being rediscovered in a revival of quality—quality products as well as service. And I believe it's time for us to encourage, recognize and reward that effort.

And that concludes my statement.

[The prepared statement of Mr. Hudiburg follows:]

JOHN J. HUDIBURG

CHAIRMAN OF THE BOARD & CHIEF EXECUTIVE OFFICER
FLORIDA POWER & LIGHT COMPANY

John Hudiburg has been with Florida Power & Light Company since 1951. A Georgia Tech graduate, he began as a student engineer and held various engineering and operating positions on his way to becoming FPL's President in 1979, its Chief Executive Officer in 1983 and Chairman of the Board in 1986.

Professionally he is a Director of the Electric Power Research Institute (EPRI), the Edison Electric Institute (EEI), and the Southeastern Electric Exchange (SEE). In 1980 he was awarded the American Society of Mechanical Engineer's "Outstanding Leadership Award for Energy Engineering Sciences."

John is an alumnus of the Harvard Business School's Advanced Management Program and currently serves on the National Advisory Board of Georgia Tech.

His civic activities include membership in the Florida Council of 100, and he is a director of the North Carolina National Bank of Florida and the Miami Children's Hospital. He was the 1984 Campaign Chairman for the Dade County United Way.

QUALITY AWARD TESTIMONY
SCIENCE, RESEARCH AND TECHNOLOGY SUBCOMMITTEE
OF THE
HOUSE COMMITTEE ON SCIENCE AND TECHNOLOGY
WASHINGTON, D.C.
JUNE 25, 1986
JOHN J. HUDIBURG
CHAIRMAN OF THE BOARD AND CHIEF EXECUTIVE OFFICER
FLORIDA POWER & LIGHT COMPANY

MR. CHAIRMAN ... IT'S MY PLEASURE TO BE HERE TODAY, ALONG WITH OTHERS WHO SHARE A COMMON VISION, TO TALK ABOUT QUALITY OF AMERICAN GOODS AND SERVICES ... AND, THE CONCEPT OF A NATIONAL AWARD FOR OUTSTANDING IMPLEMENTATION OF CORPORATE QUALITY PROGRAMS.

"AMERICAN QUALITY"...IT HAS THE "RING" OF HISTORIC PRECEDENT ... OF FOUNDING PRINCIPLES LIKE "FREEDOM" AND "LAND OF OPPORTUNITY"... BUT SOMEWHERE ALONG THE LINE THE U.S. REDUCED THE CONCEPT TO RHETORIC.

UNLIKE "LADY LIBERTY", WE HAVE NO MOUNMENT TO AMERICAN QUALITY. BUT WE NEED TO BUILD ONE -- AND GIVE IT A SIMILAR LEVEL OF REVERENCE -- IF WE INTEND TO RECAPTURE OUR COMPETITIVE STANDING IN THE WORLD MARKETPLACE. I BELIEVE A LEGISLATIVE EFFORT IS THE BEST, AND PERHAPS THE ONLY WAY, TO ACCOMPLISH THIS GOAL AND GIVE IT LASTING AND MEANINGFUL ESTEEM.

BEFORE WE TAKE UP THAT POSSIBILITY, ALLOW ME TO PROVIDE A LITTLE BACKGROUND, A FEW EXAMPLES OF HOW QUALITY WORKS AT MY COMPANY AND A BRIEF STATUS REPORT ON THE "STATE OF THE QUALITY CONCEPT" IN BUSINESS TODAY.

WITH ALL DUE RESPECT TO THOSE WHO HAD THE FORESIGHT TO RECOGNIZE A GOOD THING, EMBRACE IT, AND MAKE IT WORK TO THEIR ADVANTAGE -- THE CONCEPT OF QUALITY CONTROL WAS NOT INVENTED IN JAPAN.

I HAVE GREAT RESPECT FOR THE JAPANESE TQC SYSTEM. HOWEVER, THE BASIC IDEA FOR THIS SYSTEM WAS CONCEIVED IN THE U.S. BY MEN LIKE EDWARDS DEMING AND JOSEPH JURAN ... EXPORTED FOR LACK OF INTEREST AT HOME ... MANUFACTURED IN JAPAN ... AND, WHEN IT MET WITH MUCH SUCCESS ... RETURNED AS AN IMPORT.

THANKS TO THE SUCCESS OF THE JAPANESE, QUALITY IMPROVEMENT PROGRAMS HAVE BECOME A PROVEN BUSINESS STRATEGY. RECOGNIZING THAT AMERICAN PRODUCTS WERE BEING OVERWHELMED BY FOREIGN COMPETITORS, MAJOR U.S. CORPORATIONS BEGAN ADOPTING SIMILAR PROGRAMS IN THE '70s AND '80s.

AS A RESULT, CUSTOMER-ORIENTED, QUALITY MANAGEMENT PROCESSES WERE REJUVENATED IN THE UNITED STATES, AND AMERICAN KNOW-HOW WAS APPLIED (AS WE'RE APT TO DO ONCE WE IDENTIFY A GOOD THING) TO IMPROVE AND REFINE THE PROCESSES.

OR, AS WINSTON CHURCHILL ONCE NOTED: "AMERICANS CAN ALWAYS BE COUNTED ON TO DO THE RIGHT THING, BUT ONLY AFTER THEY HAVE TRIED EVERYTHING ELSE."

SO TODAY, MANY OF THE NATION'S BUSINESSES AND INDUSTRIES ARE HARD AT WORK ON PROGRAMS DESIGNED TO BRING ABOUT A RENAISSANCE OF AMERICAN QUALITY.

THE INCENTIVE FOR QUALITY IMPROVEMENT PROGRAMS IS GREAT FOR A NUMBER OF REASONS. FOR ONE -- THE COMMERCE DEPARTMENT'S MOST RECENT ESTIMATES SUGGEST THAT SOME SEVENTY PERCENT OF ALL AMERICAN-MANUFACTURED PRODUCTS ARE EITHER CURRENT OR PROSPECTIVE TARGETS FOR FOREIGN COMPETITION.

AT FLORIDA POWER & LIGHT COMPANY, FOR EXAMPLE, OUR QUALITY IMPROVEMENT PROGRAM HAS MOVED BEYOND THE QUALITY CIRCLES CONCEPT -- OR QUALITY IMPROVEMENT TEAMS AS WE CALL THEM -- TO A PHASE WE CALL POLICY DEPLOYMENT.

THE TEAM OR 'CIRCLE' CONCEPT, IF YOU'RE NOT FAMILIAR WITH IT, BRINGS EMPLOYEES TOGETHER TO DISCUSS PROBLEMS AND OPPORTUNITIES OF THEIR OWN CHOOSING. THIS BEGINNING PHASE ALSO PROVIDES EMPLOYEES WITH A FORMAL PROCESS FOR DETERMINING THE STEPS THAT CAN BE TAKEN TO SOLVE THE PROBLEM, OR MAKE THE MOST OF THE OPPORTUNITY...AND MORE IMPORTANTLY, IT PROVIDES THEM WITH A PROCESS FOR MANAGEMENT APPROVAL AND IMPLEMENTATION OF THEIR PLAN.

I CAN TELL YOU THAT THE RESULTS OF THIS TYPE OF APPROACH ARE PHENOMENAL.

OUR EMPLOYEES HAVE BEEN VERY ENTHUSIASTIC ABOUT THE TEAM CONCEPT FROM THE BEGINNING. TODAY WE HAVE MORE THAN SEVENTEEN HUNDRED QIP TEAMS COMPANYWIDE. THAT'S EIGHT THOUSAND OF OUR EMPLOYEES -- OR MORE THAN SIXTY PERCENT OF OUR WORK FORCE -- THINKING ABOUT ... TALKING ABOUT ... AND DOING SOMETHING ABOUT QUALITY.

OUR QUALITY IMPROVEMENT TEAMS HAVE COME UP WITH THOUSANDS OF PROBLEM SOLUTIONS. I WILL ILLUSTRATE THE WIDE SPAN OF SOLUTIONS WITH TWO EXAMPLES - AN INTEROFFICE MAIL PROCEDURE THAT ACHIEVED A NINETY-THREE PERCENT REDUCTION IN INCORRECTLY ADDRESSED MAIL AND RESULTING OVERTIME ... AND A RECORD SETTING, THIRTY-EIGHT DAY, REFUELING OF OUR ST. LUCIE NUCLEAR PLANT -- ABOUT ONE HALF THE NORMAL TIME AND TEN DAYS FASTER THAN FPL'S PREVIOUS RECORD.

THE RESULTS OF THESE AND OTHER QUALITY IMPROVEMENT TEAM EFFORTS HAVE DOCUMENTED SAVINGS TO FPL CUSTOMERS IN THE MILLIONS OF DOLLARS.

THE SECOND PHASE OF OUR QUALITY IMPROVEMENT PROGRAM, CALLED POLICY DEPLOYMENT, IS EQUALLY IMPORTANT AS IT PROVIDES US WITH A STRUCTURE FOR COMMUNICATING MANAGEMENT DIRECTION, SETTING STRATEGIC OBJECTIVES AND DEVELOPING PROJECTS TO MEET THOSE OBJECTIVES.

AT FPL IT IS A PROCESS WHERE "BREAKTHROUGHS" ON A FEW SELECTED ISSUES ARE ACHIEVED THROUGH CONCENTRATED ORGANIZATIONAL EFFORTS AND RESOURCES.

LAST YEAR WE ALSO INTRODUCED THE THIRD AND FINAL PHASE OF OUR TOTAL QUALITY EFFORT CALLED QUALITY IN DAILY WORK.

THE KEY TO QUALITY IN DAILY WORK FOR OUR PEOPLE IS TO LEARN AND UTILIZE THE PROVEN PROBLEM-SOLVING TECHNIQUES OF OUR QUALITY IMPROVEMENT PROGRAM AND THEN APPLY THEM TO EVERYDAY WORK.

THERE IS NO QUESTION IN MY MIND, THAT THE RECOGNITION FLORIDA POWER & LIGHT RECEIVED EARLIER THIS MONTH FROM THE EDISON ELECTRIC INSTITUTE FOR "EXCELLENCE AMONG AMERICA'S ENERGY COMPANIES" WILL GO A LONG WAY TOWARD PERPETUATING THE ENTHUSIASM OUR PEOPLE HAVE FOR THE PROGRAM AND THE KIND OF RESULTS IT CAN EARN.

I MIGHT ADD THAT THE AWARD IS NOT AN AWARD FOR QUALITY -- BUT A "PEER" AWARD FOR EXCELLENCE IN PROGRAMS OR SERVICE -- FPL JUST HAPPENED TO BE SELECTED AS A RECIPIENT OF THE AWARD THIS YEAR ON THE BASIS OF OUR QUALITY IMPROVEMENT PROGRAM.

WHILE OUR GOAL IS QUALITY, THE TRUE TEST FOR FPL, AND FOR OTHERS, WILL BE CUSTOMER SATISFACTION.

ALL THIS IS BY WAY OF SAYING THAT AMERICAN INDUSTRY, FPL INCLUDED, IS BEGINNING TO UNDERSTAND THAT IMPROVED QUALITY IN GOODS AND SERVICES, AND IMPROVED PRODUCTIVITY GO HAND-IN-HAND. A COMMITMENT TO EXCELLENCE IN MANUFACTURING AND SERVICES IS ESSENTIAL FOR THE WELL-BEING OF THE U.S. ECONOMY AND SOCIETY.

WE BELIEVE THAT A NATIONAL QUALITY AWARD WOULD HELP STIMULATE THIS PROCESS, FOR THE PRIDE OF RECOGNITION, AND FOR THE RESULTING COMPETITIVE EDGE OF GREATER PROFITABILITY.

WE ALSO BELIEVE THAT EVERYONE -- WINNERS, NEAR WINNERS AND BEGINNERS -- WILL BENEFIT FROM THE EXISTENCE OF THE NATIONAL AWARD PROGRAM I WOULD PROPOSE. CRITERIA, ONCE PUBLISHED, CAN SERVE AS A BENCHMARK, AS WELL AS A HALLMARK OF ACHIEVEMENT.

IN JAPAN, THE DEMING PRIZE FOR OUTSTANDING STATISTICAL QUALITY CONTROL CONTRIBUTIONS, IS THE MOST PRESTIGIOUS ACHIEVEMENT A COMPANY CAN EARN.

A CLOSE LOOK AT ITS OBJECTIVES HAS PROVIDED US WITH AN UNDERSTANDING OF WHAT OUR AWARD MUST CONSIST OF, IF IT IS TO BE EQUALLY MEANINGFUL:

NUMBER ONE: IT MUST BE PRESTIGIOUS.

TO ACHIEVE THE MAXIMUM PRESTIGE THE AWARD SHOULD BE LIMITED TO JUST A FEW A YEAR AND SHOULD BE PRESENTED BY THE PRESIDENT. WHILE I BELIEVE THE PRESIDENT SHOULD BE THE PRESENTER, CLEAR DIRECTION FROM CONGRESS VIA LEGISLATION WILL INSURE THAT THE AWARD WILL BE CONTINUED REGARDLESS OF THE POLITICS OF FUTURE ADMINISTRATIONS.

NUMBER TWO: IT MUST BE SELF-FUNDING.

A FUNDING FOUNDATION SHOULD BE ESTABLISHED. MOREOVER, PUBLIC ACCEPTANCE WILL BE FAR GREATER IF THE COMPANIES APPLYING FOR THE AWARD FOOT THE BILL FOR THE CONSULTING SERVICES OF THE EVALUATORS OR JUDGES, RATHER THAN THE TAX PAYER.

NUMBER THREE: IT MUST BE EARNED.

BY THAT I MEAN THAT THE CRITERIA MUST BE RIGOROUS ... REQUIRING NOT ONLY A WRITTEN RESPONSE TO PUBLISHED CRITERIA, BUT ALSO A SITE VALIDATION VISIT BY A PANEL OF QUALIFIED JUDGES.

IN ORDER TO MEET THESE THREE IMPORTANT MUSTS ... THE ENTIRE PROGRAM MUST ALSO BE ADMINISTERED PROPERLY AND BY A "BODY" DESIGNATED BY THE LEGISLATURE.

THERE EXISTS TODAY A NUMBER OF ORGANIZATIONS ESTABLISHED TO SERVE THE NATION'S INDUSTRIES AS QUALITY PROGRAM CONSULTANTS, INCLUDING THE AMERICAN SOCIETY OF QUALITY CONTROL, THE JURAN INSTITUTE AND THE AMERICAN PRODUCTIVITY CENTER. THEIR CONTRIBUTIONS TO OUR PROGRESS ARE IMMEASURABLE AND THEIR WILLINGNESS TO ADMINISTER, AND EVEN FUND THE AWARD, IS BOTH GENEROUS AND LOGICAL.

HOWEVER, I BELIEVE A GOVERNMENT COMMISSION SHOULD BE ESTABLISHED TO SET POLICY FOR THE AWARD. IT COULD SELECT ONE OF THESE OTHER QUALITY GROUPS TO ADMINISTER THE AWARD. THIS JOINT COMMITTEE COULD BEST DETERMINE THE CRITERIA FOR THE AWARD, AND FOR THE JUDGES AND OVERSEE THE ADMINISTRATION OF THE FUNDING. I BELIEVE THE APPROPRIATE ORGANIZATION EXISTS IN THE AMERICAN SOCIETY FOR QUALITY CONTROL.

MOST MAJOR U.S. CORPORATIONS ARE ACTIVE IN THE ASQC, WHILE MEMBERS OF THE JURAN INSTITUTE, THE AMERICAN PRODUCTIVITY CENTER AND OTHERS MAINTAIN ACTIVE TIES TO IT.

MR. CHAIRMAN ... WE WOULD LIKE TO SEE THE PHRASE ... "THEY JUST DON'T MAKE 'EM LIKE THEY USED TO ..." DISAPPEAR FROM THE AMERICAN VOCABULARY.

OVER THE YEARS, CONSUMERS HAVE UTTERED THOSE WORDS MORE AND MORE AS AMERICAN PRODUCTS SEEMED TO OFFER LESS AND LESS IN TERMS OF QUALITY.

BUT FOR THOSE WHO THINK CARE AND CRAFTSMANSHIP WENT OUT WITH THE FRIGIDAIRE AND CAME BACK WITH THE TOYOTA, THERE IS GOOD NEWS -- THE TIMES ARE CHANGING AND SO IS THE ATTITUDE TOWARD QUALITY IN AMERICA.

THE TRUTH IS, IN MOST CASES AMERICANS ARE PROBABLY MAKING THINGS "BETTER THAN THEY USED TO ..." THE PRIDE OF "MADE IN AMERICA" IS BEING REDISCOVERED IN A REVIVAL OF QUALITY -- QUALITY OF PRODUCTS AS WELL AS SERVICE.

I BELIEVE THAT IT'S TIME TO ENCOURAGE, RECOGNIZE AND REWARD THAT EFFORT.

THANK YOU FOR LISTENING AND FOR THE OPPORTUNITY TO APPEAR HERE TODAY.

Mr. **Brown**. Mr. Hudiburg, you've made a very interesting and important proposal, and I think you may have made it just at the right time. By that I mean it's an idea whose time has come, and I think that with the leadership of people like Mr. Fuqua it's quite possible that this program could be established, perhaps even in this Congress. And I would certainly hope so. We appreciate that contribution.

And since you have mentioned the important role of the American Society for Quality Control, this would be a good time to hear from Mr. Hansel, then.

Mr. **Hansel**. Thank you, Mr. Chairman. I would like to thank you for this opportunity to appear before this subcommittee and to testify on ways to make America more competitive in the global marketplace.

My name is John Hansel, president of Systems Integration & Management Corp. I have over 30 years of experience in the quality and assurance sciences field with a special expertise in the energy and space technology disciplines. Previously, I was director of quality and reliability assurance for the Apollo Space Program at Cape Kennedy in the 1960's, and subsequent to that assignment I served as director of quality and reliability on the space shuttle orbiter program for Rockwell International. I am appearing here today as chairman of the board of ASQC—the American Society for Quality Control. Accompanying me, to my left and behind me, is Sandra Edson, who is the executive director of that society.

The American Society for Quality Control is the world's largest and oldest professional society concerned with quality and quality control. We have over 50,000 individual members in 61 countries around the world and the support of over 400 corporations here in the United States. We also have affiliate relationships with 13 other professional societies around the world, including a new agreement with the People's Republic of China.

Members of the society developed most of the quality methods and technologies now in use throughout the world, including statistical process control, quality costs, total quality control, and quality improvement programs just to name a few. Among our members we count the distinguished and illustrious names of Dr. Deming, Dr. Joe Juran—who is on my left—Phillip Crosby, and Dr. Armand Fiegenbaum.

The purposes of our society are to promote a greater awareness of the need for quality, to promote research and applications of quality and quality-related technologies, and to develop standards for quality. We certify quality professionals via examination and provide state-of-the-art technical and educational information for quality professionals, the private sector, government, and academia.

We promote a national campaign with a theme of "Quality First" in American business and industry. This campaign was launched in 1984 with a congressional resolution sponsored by Stan Lundine with support by members of your committee. President Reagan signed a proclamation setting aside October 1984 as a National Quality Month. That is a continuing effort. This year, our campaign chairman is Douglas Danforth, chairman of Westinghouse Electric Corp.

While your committee explores ways to stimulate quality commitments and exploitations of American inventiveness in the private sector, I am pleased to report that that simple resolution is beginning to have a significant and timely impact on the private sector. That resolution provided credibility, urgency and substance to educational efforts. Without it, the campaign would have had no distinguishing context or rationale. It would have been lost among the other educational programs that compete for industrial attention.

We have provided your committee with examples of the kind of literature that was developed for that campaign. You have copies of that with you. We have also included a reprint of Fortune magazine's first special section on quality, which we initiated and sponsored last year as a part of this campaign. The Fortune activity is being repeated again this year, as we now enter our third year for that campaign.

ASQC was formed 40 years ago, this year, as an outgrowth of the quality imperatives that burgeoned during World War II. Quality control and the application of quality technology were America's secret weapons during World War II. It was the only way that American industry could guarantee the reliability and durability of the weapons and munitions from the factory floors to foreign fronts.

Today, there is a different war, an economic war that is more pernicious, more perilous, and more profound. We may not like the war metaphor, but the reality of the encroachment we can no longer ignore. Mr. Chairman, I call to this committee's attention an excellent analysis of this reality by the late historian and distinguished publisher—Pulitzer-Prize-winning author, Theodore H. White. For the record, I ask that this article in the New York Times, entitled "Danger from Japan," be included as a part of my testimony.

Mr. **Brown**. Without objection, it will be included.

Mr. **Hansel**. Thank you.

If Theodore White's analysis and the collaboration by other observers is correct, we should not just dismiss the wounded, lame, dead and dying industries of America as casualties of the free enterprise. They are targets that have been hit by a new kind of war, an undeclared, industrial manufacturing and marketing war.

Mr. Chairman, there will be no enduring prosperity in America if we continue to let our manufacturing base in this country further erode. We can take no solace in a growing economy when that growth is only in the private sector and at the expense of the manufacturing base. Our essential freedoms and independence are threatened, and we will all be held hostage if we become a nation that is solely dependent on service industries for our economic survival.

It is time for a fundamental restructuring of many of our basic institutions if we are serious about the continuity of the American way of life. For example, our graduate schools of business are cranking out corporate soldiers who are concerned with winning the battles of short-term profits but know little or nothing about product or process management. By contrast, our management counterparts in Japan have come up through the ranks. Every Japanese manager has "combat" experience on the assembly line. They know the ins and outs of production which is synonymous with quality over there. So when they become officers they manage for quality; in other words, they manage with the basics, with the fundamentals of quality.

This committee will no doubt hear, and may even believe, that labor costs, international monetary policies and foreign government subsidies are the principle factors that have enabled our overseas competitors to price their products below ours, and that price is the real war. While these are effective strategies, they camouflage the fundamental reason, or lesson that we know and they know about quality—that quality improvement reduces the cost of manufacturing and thereby the cost of products and services.

The average American manufacturing company consumes between 15 and 30 cents of every gross sales dollar making sure that things are done right the first time or fixing things that have gone wrong. The comparable Japanese figures for producing the same or higher levels of quality are between 5 and 10 cents of every sales dollar.

We also know that quality is not a short-term strategy. It is a fundamental long-term way of doing business. It must be management driven and customer oriented. I think you've heard that from the other two speakers this morning. And it requires change, major change.

Restructuring the way we do business to accommodate the demands of quality improvement processes takes time and money, but the long-term—and I emphasize "long-term"—investment strategy in quality ultimately accomplishes two things: reduced costs and increased customer satisfaction. That is true for industry and it is true for government.

We need no new quality technologies or strategies to move this country forward on a more competitive basis. All we need is the resolve and the relentless pursuit by top management in industry and government to implement existing technologies. That is the only way to exploit, or to more aptly describe the proper direction of this action, to "inploit," or to heighten the American inventiveness to a competitive advantage.

Quality is the key to pride, productivity and profitability. That is a historical fact that we can bank on today to secure tomorrow's prosperity. However, Mr. Chairman, there is no basic training in quality to which we are committed as a nation. There is no national quality agenda. There is no national statement of purpose or resolve to put quality first.

The clearest difference between the United States and Japan is not product quality but a national purpose and resolve to put quality first. Simply put, Japan has the resolve, America does not.

What can Congress do about this? We are less certain about what you should do, but we offer the following proposals for your consideration.

First, I'd like to ask that the text of the Quality Manifesto, which I'll leave copies—that document was drafted and signed by the 23 living past presidents of our society. I'd ask that it be made a part of the record.

Mr. **Brown**. Without objection, it will be made a part of the record.

Mr. **Hansel**. This Quality Manifesto was issued in May as a part of our 40th anniversary deliberations as we looked forward to the challenges that face this nation and American industry in the future, the next 40 years. The declaration of quality calls on government, business, educational institutions, professional groups and individuals to do something specific about quality improvement. We are using this opportunity to make this document public today; that is, outside of our society, for the first time. It will receive additional distribution through many avenues in the future.

The call to action in that document for the Government, and it could begin with the tasks and interests of your subcommittee, is—and I quote:

> Government must assume the lead role in declaring and defining the importance of quality as a national priority. It must make clear that quality which enhances productivity and reduces cost is the most effective, competitive strategy for economic survival and prosperity. All government products and services must be procured and dispensed with a relentless pursuit for quality.

How can Congress best do this? Respectfully, we offer this primary recommendation. That Congress authorize a GAO study to do two things: First, determine the level of awareness and application of the quality improvement process in the administrative side of Government; and second, determine the role that quality plays in the Federal Government process and determine if quality, cost and schedule are treated as equal partners.

Based on these findings, Congress should hold additional hearings, if necessary, and draft appropriate legislation to implement the findings of that study.

Government can best influence industry by example. There are some exciting things going on in government, as there are in the private sector, with what we refer to as the administrative application of quality or service quality. For example, the Equal Employment Opportunity Commission recently used a quality improvement program to cut the average time spent on rework by 50 percent in less than 2 months. It was NASA's relentless commitment to quality that characterized the successes of the early NASA programs and a slackened effort to both product and process management that contributed to the shuttle accident. NASA is now going back to the very basics.

What else is Government doing? Or not doing? We know of some efforts in the Department of Labor, some at IRS. Quality has always been a buzz word in the Department of Defense procurement offices. But how significant is it? In the procurement process, does Government put first priority on cost or who can perform the service best? I've been on the other end. What has the Government done about technology transfer—transfer of the most effective technology or success stories from one Government agency to another or from one industry to the Government?

It is in my sense that quality improvement programs in Government are isolated, not representative or widespread. A GAO study, it seems to us, could identify these programs, determine the cost savings and correlate the level of improved products or services. This study could also identify the attitudes and knowledge of Government agencies toward quality improvement and recommend ways to implement quality improvement processes in all aspects of Government functions and services.

We strongly feel that this study should not be adversarial; rather, it should, by definition, identify the beginning of a quality improvement process for the way all of Government should do business. In the process of this study, we feel that Congress, itself, will uncover ways to improve the quality of its functions while reducing the cost to Government. If not cost reduction, then how to increase output and productivity.

Finally, Mr. Chairman, we are aware that this subcommittee and other witnesses are here to testify on the need for a national quality award similar to the Deming Prize given in Japan. The ironies of this postulate has not escaped us as a society. Here we have our competition giving out their highest award to industry in the name of our five-star quality general, if you will; a psychological device that rivals the best of any subversive wartime gimmick. The second irony is that we in the United States are talking about modeling ourselves after Japan and learning from Japan what we taught them in the first place.

Notwithstanding the irony, we need to carefully consider the benefits and risks of a national quality award. The operative concern should be the proper context of such an award.

Is a national award what American industry needs to be properly motivated to do something about quality improvement? Are not the management and economic and national security motivations strong enough? Have these been properly articulated? Is the concept of winning an award that would give dubious marketing advantage to the winners so compelling that a national award is necessary? If there are winners, what about the losers? What happens if American Honda wins the award? Is an award the best motivational strategy at our disposal? We do not think so.

At this stage of global competitiveness, I feel that the last thing American industry needs is an internal competition for a national quality award, especially since an award implies winners and losers. We need to carefully and fully understand the context for a national award.

The American Society for Quality Control would support and participate in an award process if it has a proper context. By that we mean a substantial technical assistance program to provide guidelines, training—as emphasized by Mr. Hudiburg—and sharing of effective strategies with all industry and Government.

The model for this context is the conceptual framework for the NASA Excellence Award for Quality and Productivity which our society administers for the NASA. The shuttle accident has overshadowed the first-year results of this program. However, the careful development of the criteria and the administrative process for this award, in our judgment a precursor for any national award, has established a model for the process and proper context for an award competition. The NASA award was not conceived to simply announce winning, but to identify the successful strategies and quality improvement programs or processes that are effective in product and process management, and to share that knowledge with other companies—the nonwinners, if you will.

Mr. Chairman, we ask that the pertinent information about the NASA award, including the criteria, be made a part of my statement at this time. I have copies with me today.

Mr. BROWN. It will be made a part of the record. See prepared statement.

Mr. HANSEL. You may be aware of the fact that the American Productivity Center, based in Houston, TX, is currently working with a variety of companies to organize a national award with the support of the White House. You may also be aware of the fact that there are productivity awards that are given at the State level through the U.S. Senate. We are not very familiar with the administrative process on these awards. We understand that the selection criteria varies and not all Senators participate. So, it would seem that a review of these awards should be made a part of any further deliberation of this subcommittee.

We stand ready as a society to assist you in anyway that is appropriate to either structure the GAO study, analyze their recommendations, or, absent a GAO study, provide any additional information that might be helpful to this committee.

We thank you for this opportunity to share our ideas.

[The prepared statement of Mr. Hansel follows:]

STATEMENT BY

JOHN L. HANSEL
CHAIRMAN OF THE BOARD
AMERICAN SOCIETY FOR QUALITY CONTROL

Before the

HOUSE SUBCOMMITTEE ON SCIENCE,
RESEARCH & TECHNOLOGY

HEARINGS ON:

"STRATEGIES FOR EXPLORING AMERICAN INVENTIVENESS
IN THE WORLD MARKET PLACE"

JUNE 25, 1986

Mr. Chairman. Thank you for this opportunity to appear before your subcommittee and to testify on ways to make America more competitive in the global marketplace.

My name is John Hansel, President of the ERCI Systems Integration & Management Corporation. I have over 30 years of experience in the quality and assurance sciences field with a special expertise in the energy and space technology disciplines. I was the Director of Quality and Reliability Assurance for the Apollo Space program at Cape Kennedy in the 60s, and subsequent to that assignment I served as Director of Quality and Reliability on the space shuttle orbiter program for Rockwell International.

I am appearing here today as Chairman of the Board of ASQC, the American Society for Quality Control. Accompanying me today is Sandra Edson, Executive Director for ASQC.

The American Society for Quality Control is the world's largest and oldest professional society concerned with quality and quality control. We have over 50,000 individual members in 61 countries around the world and the support of over 400 corporations here in the United States. We also have affiliate relationships with 13 other professional societies around the world, including a new agreement with the People's Republic of China.

Members of ASQC developed most of the quality methods and technologies now in use throughout the world, including statistical process control, quality costs, total quality control, and quality improvement programs to name a few. Among our members, we count the distinquished and illustrious names of Dr. Edward Deming, Dr. Joe Juran, Phillip Crosby and Dr. Armand Fiegenbaum.

The purposes of the Society are to promote a greater awareness of the need for quality, to promote research and applications of quality and quality related technologies and to develop standards for quality. We certify quality professionals via examination, and provide state-of-the-art technical and educational information for quality professionals, the private sector, government and academia.

We promote a national campaign with a theme of "Quality First" in Amercian business and industry. This campaign was launched in 1984 with a Congressional Resolution sponsored by Congressman Stan Lundine with support by members of your committee. President Reagan signed a proclamation setting aside October 1984 as a national quality month. This year, our campaign chairman is Douglas Danforth, Chairman of Westinghouse Electric Corporation.

While your committee explores ways to stimulate quality commitments and exploitations of American inventiveness in the private sector, I am pleased to report that that simple resolution is having a significant and timely impact on the private sector. That resolution provided credibility, urgency and substance to these educational efforts. Without it, the campaign would have had no distinguishing context or rationale. It would be lost among the other educational programs that compete for industry attention.

We have provided your committee with examples of the kind of literature we have developed for this campaign. We have included a reprint of Fortune magazine's first special section on quality, which we initiated and sponsored last year as a part of this campaign. The Fortune activity is being repeated again this year, as this campaign enters it third year.

The American Society for Quality Control was formed 40 years ago, this year, as an outgrowth of the quality imperatives that burgeoned during World War II. Quality control and the application of quality technology were America's secret weapons during World War II. It was the only way American industry could guarantee the reliability and durability of the weapons and munitions from the factory floors to foreign fronts.

Today, there is a different war, an economic war that is more pernicious, more perilous, more profound. We may not like the war methaphor, but the reality of the encroachment we can no longer ignore.

Mr. Chairman, I call to this committee's attention an excellent analysis of this reality by the late historian and distinguished Pulitzer Prize winning author, Theodore H. White. For the record, I ask that his article in the New York Times, entitled, "Danger From Japan," be included as part of my testimony.

If Theodore White's analysis and the collaboration by other observers is correct, we should not dismiss the wounded, lame, dead and dying industries of America as casualties of the free enterprise system. They are targets that have been hit by a new kind of war -- an undeclared, industrial manufacturing and marketing war.

Mr. Chairman, there will be no enduring prosperity in America if we continue to ignore this war and let our manufacturing base in this country further erode. We can take no solice in a growing economy when that growth is only in the service sector, and at the expense of our manufacturing base. Our essential freedoms and independence are threatened, and we will all be held hostage, if we become a nation that is solely dependent on service industries for our economic survival.

It is time for industry to go back to basic training. It is time for a fundamental restructuring of many of our basic institutions if we are serious about the continuity of the American way of life. For example, our graduate schools of business are cranking out corporate soldiers who are concerned with winning the battles of short-term profits but know little or nothing about product or process management. By contrast, our management counterparts in Japan come up through the ranks. Every Japanese manager has "combat" experience on the assembly line. They know the ins and outs of production which is synonomous with quality over there. So, when they become officers, they manage for quality. In other words, they manage with the basics, with the quality fundamentals.

Mr. Chairman, this committee will no doubt hear, and may even believe, that labor costs, international monetary policies and foreign government subsidies are the principle factors that have enabled our overseas competitors to price their products below ours, and that price is the real war. While these are effective strategies, they camouflage the fundamental lesson that we know, and they know about quality: that quality improvement reduces the cost of manufacturing and thereby the cost of products and services. The average American manufacturing company consumes between 15 and 30 cents of every gross sales dollar making sure that things are done right the first time or fixing things that go wrong. The comparable Japanese figures for producing the same or higher levels of quality are between 5 and 10 cents of every sales dollar.

We also know that quality is not a short-term strategy: it is a fundamental long-term way of doing business. It must be management driven and customer oriented. And, it requires change.

Restructuring the way we do business to accommodate the demands of quality improvement processes takes time and money, but the long-term investment strategy in quality ultimately accomplishes two things: reduced costs and increased customer satisfaction. That is true for industry and it is true for government.

We need no new quality technologies or strategies to move this country forward on a more competitive basis. All we need is the resolve and relentless pursuit by top management in industry and government to implement existing technologies. That is the only way to exploit, or to more aptly describe the proper direction of this action, to inploit or to heighten the American inventiveness to a competitive advantage.

Quality is the key to pride, productivity and profitability. That is an historical fact that we can bank on today to secure tomorrow's prosperity.

However, Mr. Chairman, there are no boot camps for American industry and certainly none for the government. There is no basic training in quality to which we are committed as a nation. There is no national quality agenda, no national statement of purpose or resolve to put quality first.

The clearest difference between the United States and Japan is not product quality but a national purpose and resolve to put quality first. Simply put, Japan has the resolve; America does not.

What can or should Congress do about this?

We are less certain about what you should do, but we do offer the following proposals and actions for your consideration.

First, I'd like to ask that the text of "The Quality Manifesto", drafted and signed by the 23 living past presidents of the American Society for Quality Control, be made a part of this record. This quality manifesto was issued in May as part of our 40th-year anniversary deliberations as we look forward to the quality challenges that face this nation and American industry in the future, the next 40 years. This declaration on quality calls on government, business, educational institutions, professional groups and individuals to do something specific about quality improvement. We are using this opportunity to make this document public today, that is outside our society, for the first time.

The "call to action" for the government in this declaration, and it could begin with the tasks and interest of your subcommittee, is:

> "Government must assume the lead role in declaring and defining the importance of quality as a national priority. It must make clear that quality which enhances productivity and reduces cost is the most effective, competitive strategy for economic survival and prosperity. All government products and services must be procured and dispensed with a relentless pursuit for quality."

How can Congress best do this? Respectfully, we offer this primary recommendation:

> That Congress authorize a GAO study to do two things: (1) determine the level of awareness and application of the quality improvement process in the administrative side of government; and (2) determine the role that quality plays in the Federal Government process.

Based on these findings, Congress should hold additional hearings, if necessary, and draft appropriate legislation to implement the findings of that study.

Government can best influence industry by example.

There are some exciting things going on in government, as there are in the private sector, with what we refer to as the administrative application of quality or service quality. For example, the Equal Employment Opportunity Commission recently used a quality improvement program to cut the average time spent on rework by 50 percent in less than two months. It was NASA's relentless commitment to quality that characterized the successes of the early NASA programs and a slackened effort to both product and process management that contributed to the shuttle accident. NASA is now going back to basics.

But what else is government doing, or not doing? We know of some efforts in the Department of Labor, some at IRS. Quality has always been a buzz word in the Department of Defense procurement offices. But how significant is it? In the procurement process, does government put first priority on cost or who can perform the service best? What has the government done about technology transfer? Transfer of the most effective technology or success stories from one government agency to another or from industry to government.

It is my sense that quality improvement programs in government are isolated, not representative or widespread. A GAO study it seems to us, could identify these programs, determine the cost savings, and its correlate -- the level of improved products or services. This study could also identify the attitudes and knowledge of government agencies toward quality improvement, and recommend ways to implement quality improvement processes in all aspects of government functions and services.

We strongly feel that this study should not be adversarial, rather it should, by definition, identify the beginning of a quality improvement process for the way all of government should do business. In the process of this study, we feel that Congress itself will uncover ways to improve the quality of its functions while reducing the cost of government. If not cost reduction, then how to increase output and productivity.

Finally, Mr. Chairman, we are aware that this subcommittee and other witnesses are here to testify on the need for a national quality award similar to the Deming Award given in Japan. The ironies of this postulate have not escaped us. Here we have our competition, the enemy in the war metaphor, giving out their highest award to industry in the name of our five-star "Quality General", if you will, a psychological device that rivals the best of any subversive war-time gimmick.

The second irony is that we in the United States are talking about modeling ourselves after Japan, and learning from Japan what we taught them in first place.

Notwithstanding the irony, we need to carefully consider the benefits and risks of a national quality award. The operative concern should be the proper context.

Is a national award what American industry needs to be properly motivated to do something about quality improvement? Are not the management and economic and national security motivations strong enough? Have these been properly articulated? Is the concept of "winning" an award, that would give dubious marketing advantage to the "winners", so compelling that a national award is necessary? If there are "winners", what about the "losers"? What happens if American Honda wins the award? Is an award the best motivational strategy at our disposal? We do not think so.

At this stage of intense global competitiveness, I feel that the last thing American industry needs is an internal competition for a national quality award, expecially since an award implies winners and losers. We need to carefully and fully understand the proper context for a national award.

The American Society for Quality Control could not support or participate in an award process if it did not have a proper context. By that we mean a substantial technical assistance support program to provide guidelines, training and sharing of effective strategies with all industry and government.

The model for this context is the conceptual framework for the NASA Excellence Award for Quality and Productivity which our society administers for NASA. The shuttle accident has overshadowed the first year results of this program. However, the careful development of the criteria and administrative process for this award, in our judgment, a precursor for any national award, has established a model for the process and proper context for an award competition. The NASA award was not conceived to simply announce winning, but to identify the successful strategies and quality improvement processes that are effective in product and process management, and to share that knowledge with other companies, the "non-winners" if you will.

Mr. Chairman, we ask that the pertinent information about the NASA award, including the criteria be made a part of my statement at this time. You may be aware of the fact that the American Productivity Center, based in Houston, Texas, is currently working with a variety of companies to organize a national award with the support of the White House. You may also be aware of the fact that there are productivity awards that are given at the state level through the U.S. Senate. We are not very familiar with the administrative process on these awards; we understand that the selection criteria varies and not all Senators participate. So, it would seem that a review of these awards should be made a part of any further deliberation of this subcommittee.

We stand ready to assist you in anyway that is appropriate to either structure the GAO study, analyze their recommendations or, absent a GAO study, provide any additional information that might be helpful to this committee. Thank you for this opportunity to share our ideas with you.

JOHN L. HANSEL

SUMMARY:

Mr. Hansel's professional career encompasses 32 years of experience in the conduct and management of large complex programs for major energy and aerospace projects. His management and technical experience covers a wide range of projects, such as the Gas Centrifuge Uranium Enrichment Plant, Three Mile Island investigation, Apollo and Space Shuttle programs, re-entry vehicles, rocket and jet engine test programs, and the Advent Satellite. More recently, Mr. Hansel has managed groups of experts in third party independent assessments of construction activities of three nuclear power plants as a consultant.

EXPERIENCE:

January 1984-
Present

SYSTEMS INTEGRATION AND MANAGEMENT CORPORATION

Mr. Hansel is President of Systems Integration and Management Corporation (SIMCO), a wholly owned subsidiary of the Evaluation Research Corporation International (ERCI). SIMCO provides a full range of engineering services to the NAVY, ARMY, NASA, NRC and the Department of Energy. These services include reliability, and maintainability engineering, quality assurance, configuration management, system engineering, data management, and logistics. Prior to this he was Vice President, Engineering Services Group for ERC. Current programs under his control include management assessments of plant construction as an independent third party expert, studies of environmental issues, energy conservation, and low-level radioactive and waste management programs. He is also serving as a consultant to three nuclear utility firms at four power plants. He has served as a consultant to the NRC on NUREG-1055, a study concerning the "Improvement of Quality and Assurance of Quality in the Design and Construction of Nuclear Power Plants."

September 1983-
January 1984

PRESEARCH INCORPORATED

As Vice President, Oak Ridge Operations Division, managed the Division's business development and marketing programs. He was responsible for management of all non-DOE contracts involving $1.9M in 1983 with projections of $4.2M in 1984. He also developed a comprehensive business plan to provide an increase in the client base and additional lines of business.

1979-1983

SYSTEM DEVELOPMENT CORPORATION

Served as Project Director of a System Support Contract from 1981 to 1983. He directed a joint venture of SDC and Daniel, Mann, Johnson and Mendenhall (SDC managing partner) responsible for providing system engineering, project planning/control, quality assurance, data management and computer services to the Department of Energy's Gas Centrifuge Enrichment Project. Accomplishments included increasing the contract value from $47M to $132M (ten-year contract period); receiving excellent ratings on contract performance and increasing the fee from 6.5% to 7%; and significantly increasing the range and types of services. In addition, he developed a system requiring the integration of quality and reliability assessments to improve the programmatic approach to systems management and quality control; provided personal consulting services to key DOE personnel on quality assurance, systems management and project management; and served as a consultant to the President's commission on Three Mile Island.

1965-1979

ROCKWELLL INTERNATIONAL/SPACE DIVISION

As Director of Quality Assurance and Reliability - Space Shuttle (1974-1979), he directed the Division's quality assurance and reliability program at the Palmdale, California assembly plant. The Program consisted of quality engineering, inspection, test, major subcontractor quality audits and reliability. Mr. Hansel managed the development of the quality program for controlling, manufacturing, assembly, test, and procurement activities as well as the supplier quality assurance program for major assemblies, i.e., mid fuselage, aft fuselage, wings, etc. In addition, he managed the quality assurance effort for the flight test program. He directed the development of highly specialized test and inspection equipment for space shuttle hardware and systems, and also directed the development of all quality and reliability data systems including collection, analysis, synthesis and feedback of results.

From 1967-1974, Mr. Hansel served as Director of Launch Operations Quality/Reliability Assurance and System Safety where he directed quality assurance and reliability programs at Cape Kennedy on the Apollo spacecraft and Saturn S-II launch vehicle.

Mr. Hansel was the Manager of Apollo Quality Assurance from 1965-1967 managing the quality assurance program on the Apollo Spacecraft and associated ground support and equipment.

1961-1965 GENERAL ELECTRIC COMPANY/MISSILE AND SPACE DIVISION

Mr. Hansel served as Manager - Product conformance, Mark VI re-entry ballistic warhead program.

1959-1961 PRATT & WHITNEY AIRCRAFT CORPORATION

Mr. Hansel served as General Foreman for the full scale Turbine Test Facility.

1953-1959 GENERAL ELECTRIC FLIGHT PROPULSION DIVISION

Served as Supervisor of the Jet Engine Component Test Laboratories.

LICENSES/CERTIFICATIONS:

Registered Professional Quality Engineer - California ASQC Certified Quality Engineer

Mr. **Brown**. Thank you very much, Mr. Hansel. You have given us an excellent statement, some very sound advice, and some precautionary warnings before we move too rapidly into an important area like this.

I'd like to ask all three of you gentlemen why it is that this great country of ours which has been the leader and the initiator of many of the efforts in quality control fails to act on the basis of our knowledge? Is it necessary that we be defeated in a war in order to recognize the importance of quality control? Are there other factors at work here, such as an overwhelming drive for short-term profitability, that has eclipsed the focus on quality? Just where did we fall down over that 40-year period when Japan was moving ahead and we were just barely holding our own or making very modest improvements?

Dr. **Juran**. Let me try to respond to that, Mr. Chairman. I've been a pretty close observer of what has happened in Japan, and, to a degree, a participant. At the outset, their competition was not a quality competition; it was a price competition. Wages in Japan were dreadfully low in those days. And in the case of labor-intensive work, nobody could outperform what they were doing, even though their methods were rather poor. They didn't have good technology.

Our companies—take the automobile industry as an example because it's so big and well publicized—they were competitive with each other and with the European countries. The methods they used were wasteful: There was a great deal of redoing; the planning, empirical to a good degree. Again, while the technology kept improving, the managerial processes did not keep pace with that. But being competitive with each other, it seemed to them that they were operating efficiently. And when a new competition came from overseas, and it was a price competition, they proceeded to respond to that, began to make things offshore where there was lower wages and the rest.

What escaped them was that the Japanese very rapidly, because of a high rate of improvement, became competitive in quality. Quality competition increased and price competition decreased. Japanese salaries went up faster than anybody else's.

And those two trends were not grasped. The signals didn't reach the top people. They have to go through layers, and failed to reach the top people until it was very late. I think, in the case of the automobile industry, the Japanese probably came up even with us about 1975. It took another 5 years for that information to get to the top where it was loud and clear. And of course, since then, we've had a good deal of action.

So you probably can fault our companies for the fact that their field intelligence wasn't nimble enough to bring the science to them before 1975, rather than subsequent to 1975.

Mr. **Brown**. Well, I think that's a correct analysis, but the signals were coming loud and clear before the automobile industry. We lost out in consumer electronics, for example, before we did in automobiles, and we didn't get the message then. We were still being driven by other forces other than recognition of the importance of quality.

Dr. **Juran**. Well, that scenario really repeated itself in all industries. You're correct. Color television—I think those lines crossed about 10 years earlier than that, and a number of companies went extinct and others had to scramble and really mount quite a crisis action in order to save their businesses.

But it was a case that our top people had never really personally taken ahold of the reins as far as quality. In the case of finance, yes; quality, no. In the case of the Japanese where their crisis, of course, was back in the 1950's, they were threatened with bankruptcy, they lost their major customer. Their defense department was abolished. It would be like our defense industries, what would they do if we abolish our Defense Department? They would have to scramble and try to find something else to do.

Mr. **Brown**. Don't even raise the thought. [Laughter.]

Dr. **Juran**. But when you can't sell your product, that's about the most insistent and piercing alarm signal you have, and it goes absolutely right to the top. So their top industry leaders, the chief executive officers, personally got in and took ahold of the reins and, of course, things happen much more rapidly than is the case when you work through all those layers. And they did that decades ahead of ourselves. We have managed quality without the top people being involved in it for many years.

Mr. **Brown**. Well, you've all emphasized the importance of this involvement of the top executives, and I'll bet you've been preaching that gospel for many, many years, haven't you? And yet, we see the top executives, as you point out, being drawn from the accountants and the lawyers and the finance people, and not getting the message; and the schools turning out those kinds of people because that was where the future lay. Now what do we have to do to get the system, without the heavy hand of Government, to act in the appropriate way?

Mr. Hudiburg?

Mr. **Hudiburg**. Well, I have spent a lot of time studying the Japanese. I have many friends over there and they're quite open about what they do. And as Dr. Juran says, it does take a great deal of commitment on the part of top management, something that they have recognized.

And commitment, I mean I will spend—I added it up—over 50 days this year just working on nothing but quality in my company. That's 2 months. But something else they did—they developed a national consensus and they developed good leadership from their government in the quality area, and from academia as well. But if you win the Deming Prize, you get to see the Emperor. So they did get leadership from government and something as well as from industry. And they got a lot of support from their professional organizations. They work together as a nation in the whole area. So this is one of the things they did right that made their progress quite rapid once they had decided to do it.

Dr. **Juran**. I might point out that national consensus is a result, not a cause.

Mr. **Brown**. Yes.

Dr. **Juran**. They started with each industry trying to save its own skin. But the collective effect of that created a national consensus. It got publicized, and everybody began to realize, "we get results if we do things this way," and out of that emerged the national consensus.

Mr. BROWN. Well, the good news is that we're in this—what we're doing right now, today, and in other ways, we're beginning to create that national consensus.

Mr. Hansel?

Mr. HANSEL. I didn't want to mislead you before in my prepared testimony, that the Government has to lead industry. I think, if quality is going to turn around in this country, it has to come, first, at the hands of the industrial leaders, certainly. I think Government needs to set a good example.

I have a couple of other observations. I think that as we look at—and Dr. Juran pointed it out very nicely—the trend of price swinging to quality. Our people for years were happy buying products and services and there wasn't much competition. There was, but they were content. If something—if they bought a toaster and it only lasted 6 months, they weren't too concerned about it; they would go out and get another one. I think today we have a more vocal consumer sector that's starting to change things.

But you asked about management. I have I guess two comments that I'd like to make. We have been trying, and I personally have been trying, and I know Dr. Juran has been trying probably twice as long as I have, to get the attention of management. It's very difficult. Most CEO's are in their position at the pleasure of the stockholders and the board of directors, as long as they produce profits. Most of those people have not been well prepared for that job in terms of quality and understanding the implications of producing quality products and what it can mean to the bottom line.

Both Dr. Juran and I mentioned figures; he mentioned in the neighborhood of 30 percent and I said 15 to 30 cents out of every dollar goes for fixing what you did bad, or wrong the first time. These people could, in the past—they're starting to see the posture and the picture, but they could not see beyond 1 or 2 years. To turn a company around and to improve the products or services of that company is not a short term. You're not going to do it in a year. You have to change the culture of the company, and that's not easy.

And it's a long-term investment. You may invest moneys today and not see the results until 1988 or 1989, and that's hard for a CEO to do.

We also have another problem that I've personally been involved in, and I know Dr. Juran has as well. Our schools, today, our engineering schools, have tried to get quality courses included in the curricula for engineers. You can get statistics in there, but that's about all you can get. You go to the business schools, and they don't want to talk to you. So we're cranking out engineers, and we're cranking out managers, and we're cranking out Harvard graduates who don't know how to spell "quality," and what the implications will be to them at the bottom line when they get into management. And I think that's another area that has to be attacked through the academia as well.

Mr. BROWN. Well, I think it's important that we all recognize that this problem is embedded in certain rather important cultural traits and societal attitudes which we're going to have to change.

This desire for a quick buck is almost identified as part of the American way. And it may be that it's our biggest problem right now because it doesn't give us that long-term perspective necessary to really improve quality.

Mr. **Hudiburg**. I'd like to say, though, that I think that the day that that was absolutely true is less so now and that things are changing. We have a program that has achieved some notoriety apparently. I'm amazed always at how widely. We get five calls a day from organizations who want to come to Miami to see what we're doing at their own expense. And we can't handle five a day, so we set aside 1 day a month and invite them down. There've been over 400 corporations, over 100 local and State governmental organizations come at their own expense, bringing sometimes as many as 10 people, for a 1-day seminar, just to see what we're doing at Florida Power & Light. And the list reads like the list of corporate America.

So the awareness is there. And I think we have turned the corner in that regard. I believe that the attention of top management has been gotten in many, many cases, and that if we can develop some real leaders in this area that that will grow and spread even wider.

Mr. **Brown**. You haven't persuaded me that the American culture is changed when I see these stories about million dollar salaries on Wall Street and insider trading because a million dollars a year isn't enough, so they want to make $10 million a year. That shows that we're out for the quick buck more than anything else.

Mr. **Hudiburg**. There will always be some, yes.

Mr. **Brown**. Dr. Juran?

Dr. **Juran**. I might mention relative to what is taking place in the last 5 years I think I've seen more effort at improving quality than at any time I've been in this work, which has been a long time. It still isn't fast enough. We've got a ship with a very big turning radius here. But definitely the recognition of the problem is there, to the credit of our chief executive officers. I wouldn't say they were all that stupid in the years in the past. The available information to them, they were meeting their domestic competition. They were profitable. And they were busy people, they couldn't—with respect to getting into detail. Every function you get into detail takes you away from some other function.

So there was a degree of logic to what they were doing. And it came as quite a shock to them that out of nowhere and from across the Pacific came something that was a totally different level of competition. It took a while for them to realize that that was so and to mobilize their resources and gather their wits. But that process has started. The amount of training that is going on is way beyond anything I've ever seen. So there is a beginning. We're off dead center, but the movement is not yet fast enough.

Mr. **Brown**. You don't happen to consult for the Ford Motor Co., do you?

Dr. **Juran**. Yes, I do.

Mr. **Brown**. Did you get them to use that slogan about "Quality Is Job 1."

Dr. **Juran**. Everybody uses that slogan, Mr. Chairman. That's—nothing unique about that. [Laughter.]

Mr. **Brown**. Gentlemen, your testimony has been fascinating and we're going to follow up on it. You probably know that the chairman, Mr. Fuqua, has drafted a piece of legislation, which he wants to introduce, dealing with this quality prize—recognition of outstanding quality. Now you've all raised enough cautions about jumping into this that I would like to ask you to each review that draft legislation—it can go through a lot of changes yet—and to submit to the committee in writing, if you don't mind, your comments with regard to that legislation.

You've had a major hand in that, Mr. Hudiburg, so maybe you already know that it's perfect. [Laughter.]

But I want to be assured that that legislation meets all of the conditions that have been set forth here for being a good initiative on the part of the Government, to give it the emphasis that it ought to have, and to give us a national posture of supporting improved quality.

And I will ask the staff to follow up on the proposal that we have the GAO look at how the Federal Government, itself, could improve some of its quality activities, and maybe we can get something moving in that area, also.

Would you be willing to do that for us?

Mr. **Hansel**. Happy to.

[Dr. Juran and Mr. Hudiburg indicating assent with a nod of the head.]

Mr. **Brown**. All right. We thank you very much for your testimony, and I hope that, and I believe that it will contribute to making some progress in this area.

All right. We have two additional witnesses. I'd like to ask them both to come up to the table at this time. Mr. Donald S. Beilman, president of the Microelectronics Center of North Carolina, at Research Triangle Park. And, Mr. Frederick Garry, vice president, General Electric.

Mr. Beilman, we welcome you here. I was down at Research Triangle Park looking at some interesting research just a few weeks ago, but I didn't happen to cover your particular area. I'll make that next time. And we are—we have been impressed by the, what you might call the overall quality of that development down there. It's made a major national contribution, so I'm sure you can give us some interesting testimony.

STATEMENTS OF DONALD S. BEILMAN, PRESIDENT, MICROELECTRONICS CENTER OF NORTH CAROLINA, RESEARCH TRIANGLE PARK, NC; AND FREDERICK W. GARRY, VICE PRESIDENT, CORPORATE ENGINEERING AND MANUFACTURING, GENERAL ELECTRIC CO., FAIRFIELD, CT

Mr. **Beilman**. Thank you, Mr. Chairman.

First, I'd like to introduce the fact that I'm speaking here today not only as the president of the Microelectronics Center of North Carolina, but as a veteran of the electronics industry for some 30 years, as a retired vice president of the General Electric Co. That makes both of us——

Mr. **Brown**. Did we make a mistake and get two General Electric people here at the same time?

Mr. GARRY. You could never make that mistake. [Laughter.]

Mr. BEILMAN. But the Microelectronics Center of North Carolina is recognized by the Congressional Office of Technology Assessment as one of the three major and unique consortia in the United States in electronics: The first is the Microelectronics Computer Technology Corp., or MCC, in Texas; the Semiconductor Research Corp., or SRC, also located in the Research Triangle Park; and our center.

I'm going to avoid discussing the topics I have at the front part of the written testimony, knowing that that will be incorporated, which chronicles the deteriorating situation in the U.S. electronics industry. I think that there are many people better qualified than I, perhaps, to give you all the economics of that.

Mr. BROWN. We will make the full statement a part of the record. And as you indicate, there have been many analyses including the Packard report and others, which have documented the general problem. So you may proceed.

Mr. BEILMAN. Thank you. I would, to put it in context, though, identify the issue of the service versus a manufacturing economy recognizing that the manufacturing portion of the electronics industry is approaching a trillion dollar a year level, and there are very few substitute kinds of industries to replace that; and the fact that the market has a very substantial influence on our defense capability, and we're clearly losing leadership there.

The industry, itself, obviously needs to modernize and restructure in order to address all of the ills and the issues that it faces. This involves, perhaps, manufacturing cooperation and certainly involves addressing the fact that the fabrication and equipment industry in the microelectronics sector is, in fact, fragmented and perhaps below critical mass to maintain world leadership.

What I'd like to address is the need and the opportunity for creative new efforts to support the industry, and therefore the economy, as it relates to modern electronics, which is so pervasive in all of the industry in the United States today.

There is a need to leverage human and financial resources, and there are limits on both. We sometimes look at our research capabilities and consider those to be unlimited. But in fact, as we look at the next generation of integrated circuit or semiconductor technology, there are limits on how many of the proper talents exist at the national level.

We need to involve industry, universities, State government, and Federal Government in new creative approaches, and we need to act wisely and in a timely way. We do not have the luxury of trying to resolve this problem over the next 10 years. I believe we have most of the resources for research and technology leadership and innovation. What is needed are real vehicles to derive added value to support U.S. manufacturing competitiveness in the area.

What I'd like to do today is to propose such an opportunity, with all humility, recognizing that there is no single solution to such a complex problem. The area I'd like to touch on is the opportunity for leadership in the next generation of integrated circuit, which we call ultra-large-scale integration. To define that, that's 2 to 10 million transistors on a single quarter-inch by quarter-inch chip.

Mr. BROWN. Is that bigger than VL?

Mr. **Beilman**. That's the next generation beyond very large-scale integration.

Mr. **Brown**. Yes.

Mr. **Beilman**. And the reason I bring it up is it really presents a whole new set of opportunities. No one, internationally or nationally, today, knows how to manufacture these circuits commercially. Whoever reaches that capability first will have a major new hold on the competitive market worldwide.

There are very serious limits both in terms of the ability to organize and design 10 million transistor circuits, the ability to fabricate them, and the ability to test them. So there are major new requirements for research and scientific approaches to understand the commercial requirement in the marketplace.

But today, there are very significant research and developments underway. I mentioned the Semiconductor Research Corp., and that is an industry-university cooperative of about $20 million a year. A very creative and very successful enterprise.

The Microelectronics Center of North Carolina is the largest State initiative in existence today. The State has provided about $83 million in direct grants to us without counting about another $40 million to the universities to support the effort. And we have industry involved very heavily with us as affiliates who work directly with us on the problems of manufacturing and working in our facility.

In addition, there are the National Laboratories who have a very substantial expenditure and very substantial capabilities related to the science and engineering for this next generation. We believe there—we need to focus these efforts and, perhaps, enhance them to provide a neutral environment for all of these resources to be brought together. Today, there is no mechanism at the national level to transfer this technology into industry. There is no national microelectronics center. We come closest to it in terms of our focus exclusively on commercial technology. We do not do any defense work.

Let me just describe the center as a model because what I'm going to do is propose a national level version of that model. The Microelectronics Center of North Carolina is run more like an industrial laboratory combining the academic research approaches with the disciplined approaches necessary to translate research into usable commercial technology. And our focus is exclusively on manufacturing technology for ultra-large-scale integration.

We have a major facility that has been provided by the State and the industry in order to provide this neutral environment for the industry to work together with the universities. We have not only the manufacturers such as IBM and General Electric as integral affiliates with their people working in the laboratory with us, but the equipment and the materials industry also works with us. This is a major system requirement: that all of the new material requirements, the new fabrication and equipment requirements, and the manufacturing requirements must be integrated in order to converge more quickly on a competitive position in the marketplace. I don't think we have the luxury today of iterating sequentially through all of the various limits that we're facing in order to harness this technology when we're competing with such disciplined enterprises as we see overseas.

What I'd like to propose is a version of this, which I've referred to as a national microelectronics initiative, or I'll use the abbreviation NMI, which would take this concept and extend it to the national level. That is, it would provide a vehicle for universities other than North Carolina universities, principally those sponsored by the Semiconductor Research Corp., which are all of the major universities at the national level, and the capabilities of selected national laboratories, both people and financial help, to bring those capabilities together in a unique way in order to facilitate this manufacturing technology and to do it in a timely way.

The conclusion I come to is that we don't have time or the incremental resources for what I would call a "green field" appoach, to start over someplace. It takes 5 years to get a facility like this going. I don't think we have that kind of luxury. I don't think we can sit idly by and watch the erosion of the industry go below threshold. And getting back above that, as we know in looking at other industries, is exceedingly difficult.

I believe we can also move quickly while industry works on getting its overall house in order, and some major restructuring may be necessary there. Again, it is not the panacea for all of the industry problems, but as we look at this unique, new defense line in the marketing area and in the manufacturing area, I believe that we can establish a leadership position and move to bring all of these good minds to bear that we have in the United States on this subject.

It's kind of paradoxical that while we have the greatest aggregate of human research resources in the world that we somehow have accepted that we're inexorably going to lose leadership and lose the industry, and I think that's very much unacceptable to the industry and to most of us in the country.

This national initiative could bring benefits to all of the industry: Manufacturing, materials, fabrication and test industry, and large and small companies, at the same time. And in addition, there may be some other opportunities to use this model to address some of the related areas in computer science and computer engineering as it relates to the organization, computer design and testing of these ultra-large-scale integrated circuits.

To give you just some feel of the power of this new technology, you could take the largest million-gate serial computer today that is being made by our major manufacturers and put it on three or four integrated circuit chips for the future. So there's another revolution ahead of us, but it does require a convergence of research and engineering—from universities and industry in a very timely way. And I don't believe we have to resort to a new major national microelectronic center, but a more cooperative involvement between the industry, university and the government community.

Thank you.

[The prepared statement of Mr. Beilman follows:]

U.S. HOUSE OF REPRESENTATIVES

COMMITTEE ON SCIENCE AND TECHNOLOGY

SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY

PREPARED STATEMENT OF DONALD S. BEILMAN
PRESIDENT, MICROELECTRONICS CENTER OF NORTH CAROLINA

NATIONAL SUBMICRON MICROELECTRONICS INITIATIVE (NMI)

25 JUNE 1986

Mr. Chairman and Members of the Committee, thank you for this opportunity to express my views on how the Federal Government can assist the U.S. modern electronics industry in accelerating the timely utilization of our university and government laboratory research into useful products for U.S. leadership in the international market place.

As I prepared this testimony, I have incorporated my views as president of the Microelectronics Center of North Carolina, a university/industry/North Carolina government initiative, as well as thirty years prior experience in the U.S. modern electronics industry. The ideas which I will share with you today have also engendered growing interest from industry and government leaders who recognize the need to explore and implement new innovative approaches that support an industry which is critical for future U.S. economic leadership.

INTRODUCTION

The electronics industry contributes directly to many sectors of the economy which utilize electronic equipment and devices for increased productivity in manufacturing, and improved product performance and services for enhanced U.S. industry competitiveness. Modern electronics affects virtually all of U.S. industry and is critically important to manufacturing. In a recent report, "Microelectronics Research and Development - Background Paper",[1] issued by the Office of Technology Assessment it was stated that:

> "Microelectronics is the cornerstone of the information technologies that pervade virtually every aspect of contemporary life. These computer and communications technologies are the basis for changes such as automation, energy conservation, and pollution control in offices, factories, automobiles, and homes; supercomputers for applications from weather prediction to computational research; new means of storing and playing back audio and video recordings; advanced telephone and television systems; and complex weapons systems for national defense. Each of these areas is critically dependent on microelectronics technology. Furthermore, the microelectronics industry - and the industries that depend on it - are vital to the U.S. economy."

MODERN ELECTRONICS INDUSTRY

According to a recent study released by the American Electronics Association and based on 1985 Bureau of Labor Statistics data, there are nearly 2.6 million people employed in the U.S. electronics industry.

The world electronics market should reach nearly $800 billion by 1988 and can be expected to surpass the trillion dollar level in the not-too-distant future, according to recent projections provided by Gnostic Concepts, a San Mateo, California, market research firm. These figures show that electronics is a major world manufacturing industry, and they do not even take into account the importance of its products to all other industries.

During the seventies, the U.S. electronics industry, specifically the high technology portion of that industry, such as semiconductors, telecommunications, data processing equipment, and other electronics equipment, provided the industry with a major portion of these worldwide markets and, as a result, created a favorable international balance of trade for this critical industry. This world leadership has been eroding in recent years as international competition becomes more intense.

To illustrate the above erosion, the Semiconductor Industry Association indicates that, in the period 1975-1980, world manufacturers of semiconductors experienced 18.3% annual growth while the U.S. semiconductor industry experienced a 23.7% annual growth rate. In contrast, in the period 1980-1984, all world manufacturers experienced 17.1% annual growth, while the U.S. experienced an annual growth rate of only 13.6%. The U.S. is not maintaining the previous share of the world market in this important industry. The U.S. share of the market is expected to drop from approximately 45% in 1984 to 42% in 1988. With a projected worldwide semiconductor market of up to $75B by 1990, this trend represents a lost opportunity for exports to hold down our current negative balance of trade.

Creative and timely U.S. actions are required now by the modern electronics industry and university and government research institutions to help avoid losses offshore like those experienced by other industries such as autos, steel, textiles, shipbuilding, and machine tools.

SERVICE VS. MANUFACTURING ECONOMY

Much has been written about the growth of the service economy and its importance to the future of the U.S. economy. It is true that the service economy has provided incredible growth - 25 million new service jobs since 1980.[7] However, there is growing concern that an economy without strong manufacturing could be vulnerable in the long run.

With the growth of a service economy and the losses in some basic manufacturing industries to overseas markets, the balance of payments continues to become a critical issue, as the U.S. becomes a net debtor nation. The U.S. deficit in the trade of goods and services for the first quarter of 1986 was $33.7B, compared to an annual deficit of only $6.3B as recently as 1981.

A healthy manufacturing economy is needed to buy services. In a recent Business Week article 3 March 1986, some economists warned that a service-driven economy could encounter serious problems if manufacturing continues to atrophy. The article points out that the largest single supplier for General Motors is not a tire or steel manufacturer, but Blue Cross/Blue Shield. Healthy manufacturing supports the jobs and that are critical for continued growth in the service sector.

The service sector, on the average, pays lower wages than the manufacturing sector. The same Business Week article indicates that, even with the surge in employment in the service sector, the average wage today, when adjusted for inflation, is lower than it was ten years ago. Average hourly wages are 11% lower in services in the private sector than in manufacturing. This could be leading to a lower standard of living since according to the Labor Department's latest employment outlook, the ten occupations that will supply the largest number of jobs through 1995 are all in the services.

The Business Week article concludes that to keep jobs and bolster incomes, the U.S. will have to take full advantage of its competitive lead in creating technology. U.S. high technology industry, and in particular modern electronics, provides both higher paying manufacturing jobs than the service sector in general and supports some of the highest paying service jobs in such areas as engineering and data processing.

One of the critical challenges before us is to utilize the extensive educational and research resources available in this country to provide the required intellectual and scientific base for the evolution of technology for the next-generation of manufactured products in such high technology areas as modern electronics. The pervasiveness of the modern electronics industry and its tradition of U.S. world leadership positions this industry as a logical target for enhanced support from the federal government.

EXISTING U.S. RESOURCES

The U.S. spent $107B on R&D in 1985, according to the Science Indicators 1985 Report. Over half of this investment was made by the private sector, but over $50B was made by the federal government. The bulk of federal support has been in defense and emphasizes development, but there has also been a renewed emphasis on support of basic research. Substantial investments are already being made and significant efforts address the science and technology challenges of modern electronics.

The U.S. has a tremendous pool of talent in science and technology and continues to lead the work in innovation. The human resources are available to address the challenges now facing us in the international market place. In the field of engineering there are now approximately 1.9 M engineers, and approximately one quarter of these are in electrical engineering. While the bulk of these engineers are in business and industry, approximately 10% of this talent is employed by the federal government and universities.

Given the importance of modern electronics to the international competitiveness of U.S. industry, government needs to make sure that the investments it is making in federal laboratories and our major research universities is effectively complementing the considerable efforts of the private sector. In fact, the federal government recognizes the importance of technological innovation and this is a major reason for increased support of basic research.

BARRIERS TO TECHNOLOGY EVOLUTION

A major strength of the U.S. system for conducting research and development is its decentralization in universities, industry and government. This mode of operation has provided us with excellent results, since independence can often lead to more innovative discoveries and developments. The disadvantage of this approach is that the process of assimilating basic research into useful technology for application in commercial products is very slow.

The intense intellectual competition now taking place in industries such as modern electronics requires additional mechanisms that do not replace the current independence and integrity of existing institutions, but speed up the process of commercializing basic research into useful products. This is critical to U.S. industry maintaining a favorable position in the international market place. Japan and the European Common Market are making major investments to assist the modern electronics industry in those countries. The European Common Market initiated the $1.0B European Strategic Program for Research and Development in Information Technology (ESPRIT) to develop advanced technology in microelectronics, advanced computer design, office automation, and computerized manufacturing techniques. The Ministry of International Trade and Industry (MITI) in Japan has been a subject of much discussion and supports Japanese Industry with partial funding for cooperative research and development in targeted industries, such as modern electronics.

As noted, our system of decentralization of research and a strong free enterprise system has, in the past, provided us with world leadership in high technology industries such as modern electronics. The intense competition that now exists in this field should not make us abandon these principles in favor of more centralized national efforts, such as those taken in Japan and Europe. However, the technical challenges now facing the U.S. modern electronics industry does require that we leverage our resources, particularly our specialized human resources, through collaborative industry/university/government initiatives. We have implemented such a program and national resource in North Carolina.

The Microelectronics Center of North Carolina (MCNC) was established to help speed up the transfer of basic knowledge into useful commercial application. The Central Laboratory of MCNC works closely with its Participating Institutions (Duke University, North Carolina A&T State University, North Carolina State University, University of North Carolina at Chapel Hill, University of North Carolina at Charlotte, and the Research Triangle Institute) to address technical challenges that support the development of next-generation, submicron, commercial integrated circuit manufacturing technology. Industry resident professionals work side-by-side with 120 MCNC permanent staff in the Central Laboratory, a fully equipped $30M advanced research facility where next-generation prototype integrated circuits can be designed, fabricated and tested. In addition, Participating Institutions have approximately 200 faculty and staff and 1600 graduate students in microelectronics-related disciplines that represent additional community resources. This unique national resource has been funded primarily by the State of North Carolina ($82M) and industry ($20M) and currently has an annual operating plan of approximately $20M.

Another joint industry/university program which is addressing part of this same challenge in technology evolution is the industry-sponsored Semiconductor Research Corporation (SRC). SRC funds basic research at American universities in integrated circuit microstructures, design, and manufacturing sciences. An annual program of approximately $20M supports basic research, conducted on campus by 200 faculty and 400 graduate students. The results of their research is made available to participating companies.

The federal government is also supporting joint university/industry ventures that are addressing the acceleration of basic research into technology development. NSF's Engineering Research Centers and collaborative efforts between national laboratories and industry are but two examples.

What is most lacking at this time is a coordinating mechanism for these efforts, one that addresses common or complementary objectives for manufacturing research and technology evolution programs and provides real added value to the substantial independent efforts now being conducted by the commercial industry.

NATIONAL OPPORTUNITY

The U.S. modern electronics industry, with appropriate trade and other fiscal considerations by the federal government, has the responsibility and the commitment to maintain market position for the current generation of technology and products, under intensive international competition.

The next-generation technology (Ultra Large Scale Integration (ULSI); i.e. 2-10M transistors on a chip) presents a new line of strategic market defense and leadership opportunities. The ability to commercially manufacture such integrated circuits presents an opportunity, not only to normalize international competitive positions, but to reaffirm long-term U.S. leadership in the critically and nationally important modern electronics industry.

The technical challenges facing the U.S. industry for the development of next-generation technology require fundamental scientific investigations. As science and technology merge in terms of physical, technical and complexity limits, there is an ever-increasing need for programs which integrate basic research with industry technology development. ULSI technology is resulting in the convergence of academic and industry applied research, as current manufacturing limitations require new scientific approaches. The establishment of stronger university/industry partnerships is rapidly emerging as an opportunity to couple scientific and engineering research with commercial technology development.

High technology industries such as modern electronics continue to recognize the importance of supporting, internally and externally, the science and technology infrastructure necessary for long-term international leadership. As a group, high technology manufacturing companies accounted for 76% of nearly $50B in industry R&D expenditures in 1983, according to the Science Indicators 1985 Report. As part of this industry, modern electronics continues to devote substantial resources to R&D.

There exists today an opportunity to capitalize on ongoing research efforts to support this leadership objective without the need, expense or time required to establish a totally new national-level set of resources. This opportunity is to establish a new, focused National Submicron Microelectronics Initiative (NMI) that will supplement ongoing industry programs with new materials and process technologies required for next-generation ULSI manufacturing.

NATIONAL SUBMICRON MICROELECTRONICS INITIATIVE (NMI)

The NMI would be a balanced and integrated program in manufacturing, research and technology exploration to support a basic research and technology transfer element for international competitiveness of the U.S. commercial modern electronics industry. Information exchange and complementary technology evolution programs of key participants in commercial integrated circuit design and manufacturing technology would be an integral element of the NMI program. The program would facilitate coordination and help influence the direction of existing basic and applied research programs of its constituents (SRC, MCNC, national laboratories, universities, member industries) to maximize overall benefits for U.S. competitiveness. (See Figures 1 & 2)

While the autonomy and integrity of existing SRC, MCNC, national laboratory, and university programs will continue, it is intended that increased integration, coordination and cross-fertilization would occur through the incremental and focused efforts of NMI. This could take place through coordination among technical boards and staff, to provide necessary influence with the national level advisory function that would be established.

A national-level advisory function would include membership from the key participants in the NMI program. Balanced representation from participating parties would include government, industry, university, and research community leaders. The major advisory function would be to make funding recommendations (through federal appropriations and incremental industry support) that would best supplement existing efforts of the key resources and provide the most added value for U.S. international competitiveness in modern electronics. Some typical activities would include:

- Identify, prioritize and support relevant technical challenges and research opportunities in commercial integrated circuit design and manufacturing (materials, process, equipment and test).
- Define and fund new technical thrust areas to accelerate developments of strategic importance by direct grants to existing university, SRC, MCNC programs or by other appropriate means at national laboratories.
- Fund and encourage staff exchanges and sabbaticals (university, industry, and government) to attract top technical talent to the NMI program.
- Support next-generation leadership for semiconductor equipment development by U.S. industry.

There are substantial individual efforts underway by industry and others to address the requirements for next-generation manufacture of integrated circuits. However, today there is no focused and coordinated program on the evolution of technology for ULSI next-generation manufacturing technology that involves all sectors of the U.S. industry, universities, and government laboratory personnel in a neutral central laboratory environment (Figure 3). The NMI program would specifically leverage existing investments in MCNC, SRC and related NSF and national laboratory initiatives. Supplementary funds would be required to take full advantage of these existing investments, which are now up to approximately $40M annually for the MCNC and SRC programs, plus existing appropriate federal laboratory and engineering research center support. In addition, NMI would further be leveraged by $82M investment that the State of North Carolina has already made in the MCNC program. The supplementary requirements are based on preliminary sizing estimates:

- New dedicated wing at MCNC Central Laboratory for SRC, university, national laboratory, engineering center, and industry visiting scientists. (~$5-8M in capital)
- Additional national funding for SRC research and MCNC manufacturing technology evolution programs (~$30M per year). This new federal government and industry support would leverage existing programs that are funded at considerably higher levels.

CONCLUSION

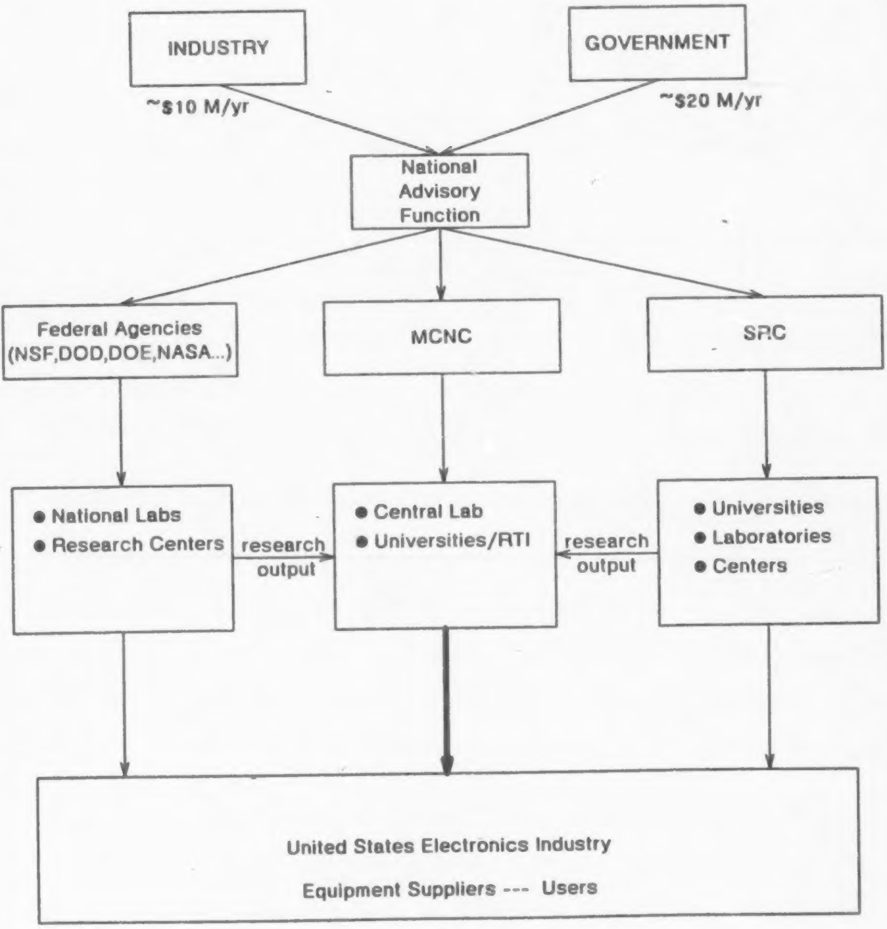
The United States has the largest aggregate and most advanced resources (human and capital) in the field of modern electronics. Evolving, however, is a growing concern, if not conviction, that the United States is inexorably on a trajectory to lose its world-wide competitive position, which would result in a loss of all or a major portion of the non-defense-related modern electronics industry. Such a result could also have a very significant future impact on the defense electronics industry and, ultimately, on U.S. defense posture.

It is my position and that of many others that we need not and cannot relinquish our position as the world leader in modern electronics. The vast majority of the technical talent and know-how is already in place to support our leadership as we enter the next-generation technology phase for modern electronics. Incremental investments by the federal government could provide the required extra value to build on the substantial programs already being undertaken by our government, industry, and universities.

There exists today the opportunity for the federal government to take decisive actions in collaboration with industry, universities, and state governments to assist the modern electronics industry. An investment now to leverage current industry, state government and other federal government programs can help achieve results far exceeding the new supplemental funding requirements. This is a unique opportunity to take action to help achieve long-term modern electronics leadership while there is still time.

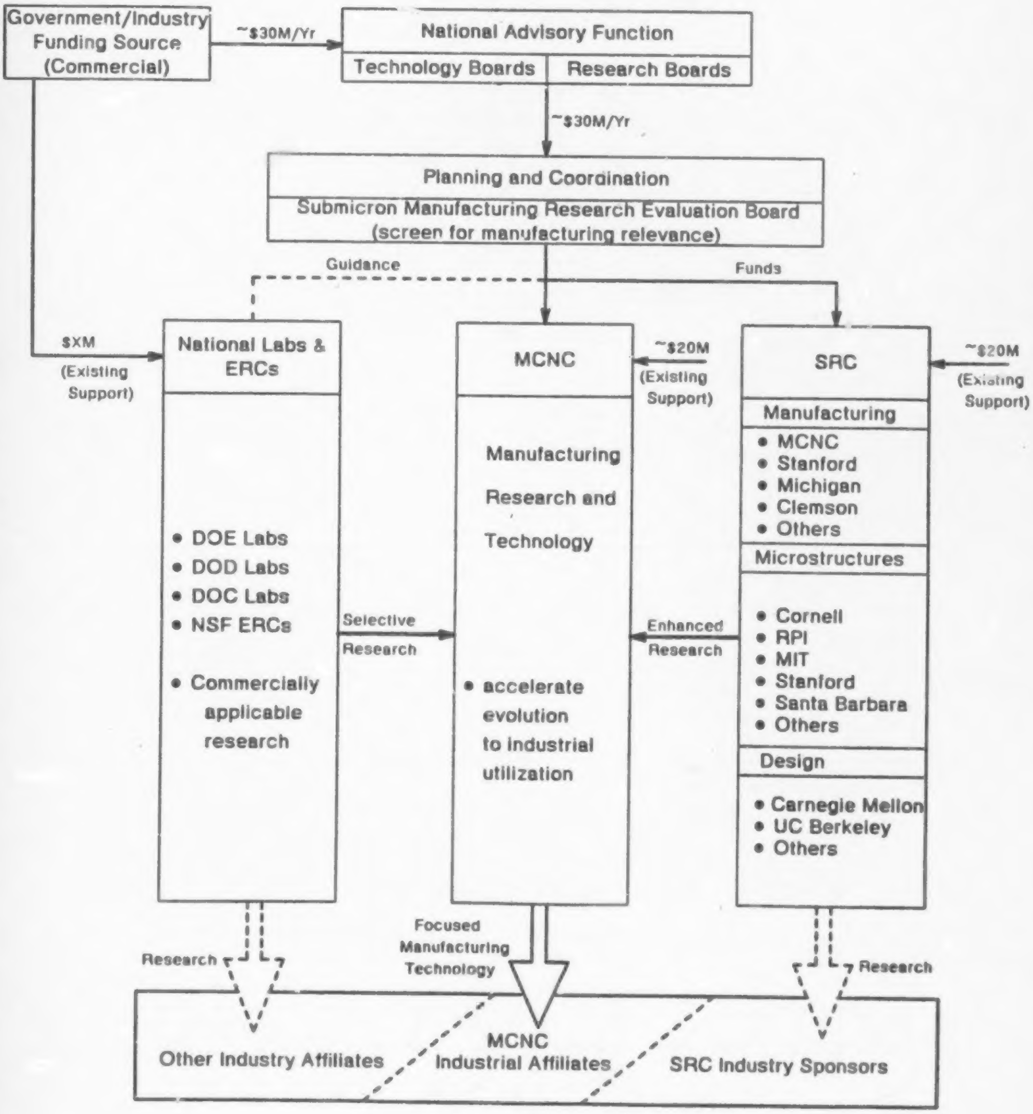
NMI INCREMENTAL FUNDING FOR MANUFACTURING TECHNOLOGY

(Figure 1 — Typical)


INDUSTRY
GOVERNMENT
~$10 M/yr
~$20 M/yr
National Advisory Function
Federal Agencies (NSF,DOD,DOE,NASA...)
MCNC
SRC
● National Labs
● Research Centers
research output
● Central Lab
● Universities/RTI
research output
● Universities
● Laboratories
● Centers
United States Electronics Industry
Equipment Suppliers --- Users

NATIONAL SUBMICRON MICROELECTRONICS INITIATIVE

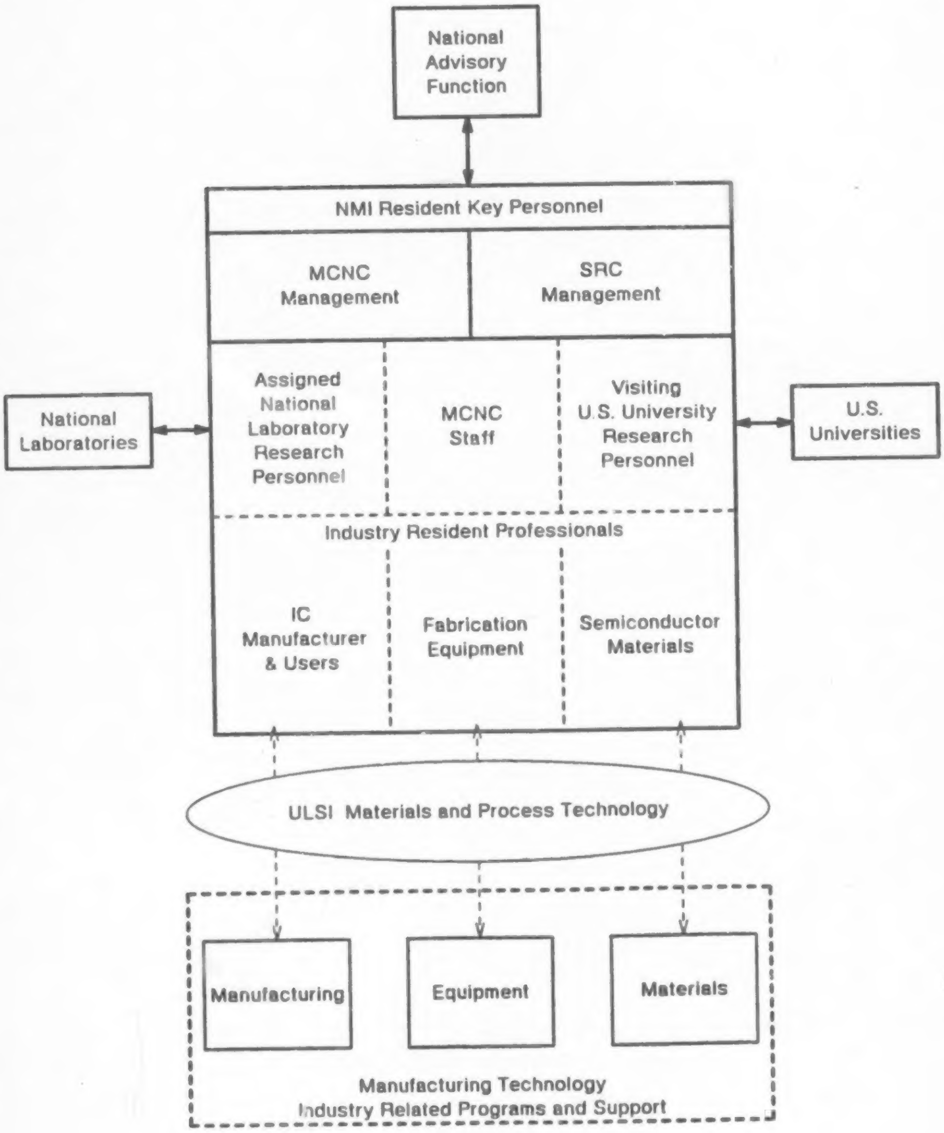
University/Industry/Government Coordination
(Figure 2 — Generic Concept)


Government/Industry Funding Source (Commercial)
~$30M/Yr
National Advisory Function
Technology Boards
Research Boards
~$30M/Yr
Planning and Coordination
Submicron Manufacturing Research Evaluation Board (screen for manufacturing relevance)
Guidance
Funds
$XM (Existing Support)
National Labs & ERCs
• DOE Labs
• DOD Labs
• DOC Labs
• NSF ERCs
• Commercially applicable research
Selective Research
MCNC
~$20M (Existing Support)
Manufacturing Research and Technology
• accelerate evolution to industrial utilization
Enhanced Research
SRC
~$20M (Existing Support)
Manufacturing
• MCNC
• Stanford
• Michigan
• Clemson
• Others
Microstructures
• Cornell
• RPI
• MIT
• Stanford
• Santa Barbara
• Others
Design
• Carnegie Mellon
• UC Berkeley
• Others
Research
Focused Manufacturing Technology
Research
Other Industry Affiliates
MCNC Industrial Affiliates
SRC Industry Sponsors

NMI Integrated Research/Technology Environment

NMI/MCNC Central Laboratory

(Figure 3)


National Advisory Function
NMI Resident Key Personnel
MCNC Management
SRC Management
National Laboratories
Assigned National Laboratory Research Personnel
MCNC Staff
Visiting U.S. University Research Personnel
U.S. Universities
Industry Resident Professionals
IC Manufacturer & Users
Fabrication Equipment
Semiconductor Materials
ULSI Materials and Process Technology
Manufacturing
Equipment
Materials
Manufacturing Technology
Industry Related Programs and Support

Mr. BROWN. Thank you very much. That's an exciting idea, Mr. Beilman. It would be much more exciting to me if it were in California, though. [Laughter.]

Mr. BEILMAN. Congressman Zschau said the same thing to me one time.

Mr. BROWN. OK. Mr. Garry?

Mr. GARRY. Thank you, sir. I am pleased to be able to respond to your invitation to speak before this committee on the General Electric approach to the world marketplace.

We're a diversifed company, as you know. We're made up of over 20 discrete businesses that fall into three general categories: Core manufacturing, technology, services—and perhaps a fourth category that includes ventures and affiliates, as well as businesses that support the other activities of the company.

I was sitting here this morning and listening to the prior triumvirate here. And unless the impression be given that all corporate executives are B-school graduates, may I say that two-thirds of General Electric's officers have a degree in engineering; that our chairman, who has a doctorate in engineering, is also the chairman, recently elected chairman of the National Academy of Engineering.

We've long believed that quality programs invariably increase productivity, but that productivity programs without quality improvement almost never result in any gain.

The extent to which our individual businesses compete in world markets varies, but they're managed under a common strategy that recognizes the need to be able to win in a highly competitive global environment. Central to this strategy has been achieving a No. 1 or a No. 2 position with regard to market share in each of the businesses we serve. And the rationale for this is that a business must be strong internationally—to be strong internationally must also be strong at home. And this is necessary to be able to protect the domestic sales against foreign competition and to field those activities that are necessary to win in the global marketplace.

Incidentally, we believe that to be number one or two in any marketplace requires that your product or service be recognized by our customers as having high quality as well as being affordable.

Another element of the strategy is to make investments in research and development and in plant and equipment that are necessary to achieve technological leadership and cost competitiveness in whatever markets we choose to compete. And this for our company has meant an investment of about $20-plus billion over the past 5 years in both research and in plant and equipment.

Still another element of the strategy is to anticipate market changes on a worldwide basis and to use speed, agility and innovation in order to meet these changes successfully. This strategy for winning in a global environment has enabled General Electric to achieve exports of some $4 billion a year over the past 5 years with the result that we have a net positive balance of trade of at least $2.6 billion after allowing for GE imports.

I chose to use General Electric's Aircraft Engine Business Group as an example of some of the things we've been doing because it's heavily involved in the world marketplace and it's success in the global environment illustrates how you can leverage U.S. technology in world markets. We entered the aircraft business, or actually the jet engine business in 1942, and for the first 20 or so years our sales were almost entirely in the U.S. market. The offshore market for our engines began to expand in the 1960's and grew more sharply in the last decade. And now, the non-U.S. market makes up about 30 percent of our engine sales.

Undergirding the success in this business has been a continuing investment in technology and productivity that has resulted in worldwide recognition of product leadership. One facet of this has been engine performance. We've improved efficiency such that we've lowered fuel consumption by a half, and engine thruster weight has been quadrupled and reliability is something like five to ten times that of the reciprocating engines that precede it. So here we have quality in terms of performance and in reliability.

Another facet has been value pricing based on total production costs, and we've made productivity investments to achieve low manufacturing costs and used these low costs to establish superior price values from the purchaser's viewpoint. R&D and productivity investments required to establish this product leadership represent 20 percent of engine costs, which is several times the average of U.S. high technology industries.

And another factor, and a key factor, in leveraging engine technology has been an evolutionary involvement in joint ventures on a worldwide basis. Initially, we licensed offshore partners with the support and encouragement of the U.S. Military Establishment. In most instances the licenses for engines were executed as part of a larger aircraft systems sale. For example, licenses were let to partners in the European Economic Community for the J-79 engine as a part of the Lockheed F-104 European Starfighter Program. And then using our experience with these early licensing agreements, we've begun to source or to buy from non-U.S. manufacturing sources certain engine parts, assembly and overhaul services, and these arrangements helped us to sell engines as part of both military and commercial aircraft systems in the foreign countries without unduly upsetting their balance of trade.

By the 1970's, we began to see indication of a widely differing aviation-related market growth rate between a highly developed country, such as the United States and the European Economic Community, and other countries in the world. In our markets, the markets we targeted were no longer solely in the United States and Europe but were moving to other areas where the forecast growth rates—this was in airline purchases, particularly—were higher and the need for cooperative international ventures would be required. Our evaluation of this situation led us to conclude that the best approach for General Electric acting in its own interest as well as the interest of the country was to form a series of joint ventures giving proper concern to protect proprietary technology and technology vital to the national defense.

With SNECMA, the French aircraft producer, we established a joint company called CFM International. We gave the concept a slogan, which was "Share To Gain"—which meant sharing the program expense, production and revenue to gain shares of a market which might otherwise have been closed to both GE and SNECMA or at least extremely difficult to penetrate. This wasn't an easy process, but throughout the process we proceeded only as supported by the Government through the mechanics of approval of data releases and export licenses.

The key ingredient was the concept of revenue sharing, not profit sharing. And this allowed us to protect the differing motives of the two participants. And another key ingredient was restricting the joint company to a specific engine called the CFM-56, which was aimed at world commercial routes.

Still another key ingredient was the division of labor—effort. We brought to this party the core engine, which is the compressor and the combustor and the turbine, with the assurance that those critical and proprietary technologies that were housed within this core were retained by General Electric. SNECMA designed and manufactured the low pressure system, the fan and the power turbine, they engineered the installation work, and we assumed overall system responsibility.

The joint program received United States and French Government approval. It was started in 1974. The success is a matter of record. To date, we've sold over 1,100 engines and they've been delivered. The CFM family provides a third of our total engine sales revenues. It is a major factor in providing jobs for 39,000 GE people in Ohio, Massachusetts, and 14 other States. And because the CFM engine is a B-1 bomber engine derivative, the program will, if our full sales potential is realized, return nearly a half billion dollars in negotiated R&D payback to the U.S. Treasury. Overall world sales from GE joint aircraft engine endeavors have created three U.S. jobs for every foreign job created.

Now there are other General Electric businesses that are leveraging U.S. technology in the world market, and I'd like to mention briefly a couple of them.

Our locomotive business was making technology and productivity investments necessary to sustain the home market strength as well as to serve the international markets. These investments include a third of a billion dollars in automation and facility modernization at Erie and Grove City, PA, and other expenditures to advance locomotive product technology such as microprocessor-based control systems.

As in aircraft engine, various endeavors are being used to secure foreign orders. We have a subsidiary in Brazil, licensees in West Germany and Australia, we're helping Mexico create a manufacturing capability, we're entering into a transfer of technology arrangement with the People's Republic of China as a followup to selling 400 locomotives to the PRC since 1984.

In the engineered plastics business, which is headquartered in Massachusetts, our high performance plastics technology and production capability give us a significant worldwide market share. The basic approach to world markets in this business is to export from the United States and to establish foreign facilities as needed based on volume or other factors.

In addition to resin production centers in New York, Indiana, the Netherlands, and a small one in Japan, we found it necessary to expand again in the United States, and are currently building a $300-plus million plant in Burkeville, AL.

The flip side of the balance of trade issue is using our technology to reduce our dependency on foreign imports. At our major appliance business in Louisville, KY, we rejected an early plan to buy refrigerator compressors from foreign sources. Instead, we combined the design talents of several of our operations and worked closely with U.S. machine tool manufacturers to develop equipment that allowed us to build a highly reliable rotary compressor to previously unattainable tight tolerances. These compressors will be manufactured in a completely automated plant in Tennessee at costs that make offshore purchase unnecessary. As a plus, the new compressor is more efficient than we could buy elsewhere, and provides more usable space for consumers at the same level of energy.

So our experience in striving to exploit our techonology in the world market has shown that there are certain key elements to success. Among these are maintaining our knowledge base through continuous investment in R&D, investing to keep our manufacturing facilities at the leading edge; recognizing that converting knowledge into sales means outstanding integration of product and manufacturing process design engineering to overcome whatever labor and capital cost advantages may be enjoyed by many non-U.S. producers; again, looking beyond domestic requirements and responding to the varying global market product and service opportunities; recognizing that a total creative business response is required which is multifunctional and stretches from the laboratory through engineering and manufacturing to the salesroom; looking for high quality, cost effective response combined with sales and distribution strategies that respond to the peculiarities of the many markets we serve to justify the huge development and facility investments that are involved; and very importantly I think is having an enthusiasm to compete in the global marketplace plus a desire to excel in it.

Again, in the free market economy, we strongly believe that U.S. industry has the primary responsibility to adjust to the global environment, and we see that aggressive U.S. companies can, in fact, compete when the international playing field is played fairly.

Government support is necessary to achieve rules that treat the United States and other trading partners uniformly. Incentives for product and facility investments are needed. Export regulations must be consistent with our need to utilize the level of technology required for penetrating global markets. In particular, we found that these global rules must be drafted in a way that permits the smaller companies to compete.

Thank you very much.

[The prepared statement of Mr. Garry follows:]

STRATEGIES FOR EXPLOITING AMERICAN INVENTIVENESS IN THE WORLD MARKETPLACE

TESTIMONY PRESENTED BY

FREDERICK W. GARRY
VICE PRESIDENT-CORPORATE ENGINEERING AND MANUFACTURING

GENERAL ELECTRIC COMPANY

BEFORE

THE COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES
JUNE 25, 1986.

Good Morning.

My name is Fred Garry and I am Vice President - Corporate Engineering and Manufacturing of the General Electric Company. I am pleased to respond to the invitation to speak before this Committee on the General Electric approach to the world marketplace.

General Electric is a diversified company made up of over twenty discrete businesses. These businesses can be grouped into several general categories - core manufacturing, technology, services, and a fourth category that includes ventures and affiliates as well as businesses that provide support to the other activities in the Company.

While the extent to which our individual businesses compete in world markets varies, they are being managed under a common GE strategy that recognizes the need to be able to win in a highly competitive global environment.

Central to our strategy has been achieving a number one or number two position in market share. The rationale for this is that for a business to be strong internationally, it must be strong at home. This is necessary to be able to protect our domestic sales against foreign competition and to fuel the activities that are necessary to win in the global marketplace.

Another element of our strategy is to make the investments in research and development, and in plant and equipment, that are necessary to achieve technological leadership and cost competitiveness in whatever markets we choose to compete. For GE this has meant $20 Billion over the past 5 years.

Still another element of our strategy is to anticipate market changes world-wide, and to use speed, agility and innovation in order to meet these market changes successfully.

This strategy for winning in a global environment has enabled General Electric to achieve exports of some 4 billion dollars a year over the last five years, which has resulted in a net positive trade balance of at least 2.6 billion dollars a year after allowing for GE imports.

General Electric's Aircraft Engine Business Group is heavily involved in the world marketplace and its success in the global environment illustrates the leveraging of U.S. technology in world markets.

General Electric entered the aircraft engine, or - more specifically - the jet engine business, back in 1942. For the first 20 or so years, our engine sales were almost entirely to the U.S. market. The offshore market for our engines began to expand in the 1960's, grew even more sharply during the past decade, and the non-U.S. market now represents about 30 percent of our engine sales.

Undergirding our success in this business has been a continuing investment in technology and productivity that has resulted in world-wide recognition of product leadership. One facet of this leadership has been engine performance. Efficiency improvements have lowered fuel consumption by almost one-half, and engine thrust per weight has been quadrupled.

Another facet of product acceptance has been value pricing based on reduced total production cost. In other words, we have made productivity investments to achieve low manufacturing cost, and used these low costs to establish superior price values from the purchaser's viewpoint.

The R&D and productivity investments that have been required to establish this product leadership represent 20 percent of engine cost, which is several times the average of U.S. high technology industries.

A key factor in leveraging our engine technology in world markets has been an evolutionary involvement in joint endeavors.

Initially we licensed offshore partners - with the support and encouragement of the U.S. military establishment. In most instances, these licenses were executed as part of a larger aircraft system sale. For example, licenses were let to partners in the European Economic Community for J79 engine production as a part of the Lockheed F-104 European Starfighter Program.

Using our experience with these early license agreements, we began to buy from non-U.S. manufacturing sources certain engine parts, assemblies and overhaul services. These arrangements helped us to sell engines as part of both military and commercial aircraft systems into foreign countries without unduly upsetting their balance of trade.

In the early 1970's we began to see indications of a widely differing aviation related market growth rate between highly developed countries - such as the U.S. and the European Economic Community - and the other countries in the world.

Our markets - the targeted markets - were no longer solely in the U.S. and Europe but were moving to other areas of the world where forecast growth rates were higher and the need for cooperative international ventures would be required.

Our evaluation of the situation led us to conclude that the best approach for General Electric, acting in its own interest as well as in the interest of our country, was to form a series of joint ventures -- giving proper concern to protect both proprietary technology and technology vital to the national defense.

With SNECMA, the French engine producer, we established a joint company called CFM International. We gave the concept a slogan - "Share to Gain" - which meant sharing the program expense, production and revenue to gain shares of a market which might otherwise have been closed to both GE and SNECMA or at least extremely difficult to penetrate.

It wasn't easy, and throughout the process we proceeded only as supported by the U.S. Government through the mechanics of approval of data releases and export licenses.

The key ingredient was the concept of revenue sharing, not profit sharing. This allowed us to protect the differing motives of the two participants. Another key ingredient was restriction of the joint company to a specific engine - called the CFM-56 - aimed at world commercial route needs.

Still another key ingredient was the division of effort. GE brought the core engine - the compressor, combustor and turbine - to the table with assurance that those critical or proprietary technologies that were housed within this core were retained by General Electric.

SNECMA designed and manufactured the low pressure system, the fan and the power turbine, and engineers the installation. GE assumed overall system responsibility.

The joint program received approval from the U.S. and French governments and the joint venture was officially formed in 1974.

The success of CFM International is a matter of record.

- To date over 1100 CFM engines have been delivered,
- The CFM engine family provides 1/3 of our total engine sales revenues,
- It is a major factor in providing jobs for 39,000 GE people in Ohio, Massachusetts and 14 other states,
- Because the CFM engine is a B-1 bomber engine derivative -- the program will -- if full market potential sales are realized -- return a half billion dollars in negotiated R&D payback to the U.S. Treasury.

Overall world sales from GE joint aircraft engine endeavors have created three U.S. jobs for every foreign job created.

There are other GE businesses that are leveraging U.S. technology in world markets. I would like to mention briefly two of them to give a broader picture of our approaches to the global environment.

In our locomotive business, we are also making technology and productivity investments necessary to sustain our home market strengths as well as to serve international markets. These investments include a third of a billion dollars in automation and facility modernization at Erie and Grove City, Pennsylvania, and other expenditures to advance locomotive product technology - such as microprocessor based control systems.

As in aircraft engines, various endeavors are being used to secure foreign orders - such as a subsidiary in Brazil, licensees in West Germany and Australia, helping Mexico create a manufacturing capability, and entering into a technology transfer arrangement with The People's Republic of China as a follow-up to selling over 400 locomotives to The PRC since 1984.

In our engineered plastics business - headquartered in Pittsfield, Massachusetts - our high performance plastics technology and production capability have given us a significant worldwide market share position. The basic approach to world markets is to export from the U.S., and to establish foreign facilities as needed based on volume or other factors.

In addition to resin production centers in New York, Indiana, The Netherlands and a small one in Japan, we have found it necessary to expand again in the U.S. and are currently building a new 300 plus million dollar plant in Burkville, Alabama.

The flip side of the balance of trade issue is using our technology to reduce our dependency on foreign imports.

At our major appliance business in Louisville, Kentucky, we rejected an early plan to buy refrigerator compressors from foreign sources. Instead we combined the design talents of several of our operations and worked closely with U.S. machine tool manufacturers to develop equipment that allowed us to build a highly reliable rotary device to previously unattainable tight tolerances.

These compressors will be manufactured in a completely automated plant in Tennessee at costs that make offshore purchase unnecessary. As a plus - the new compressor is more efficient than we could buy elsewhere and provides more usable storage space for consumers at the same level of energy consumption.

Our experience in striving to exploit our technology in the world marketplace has shown that there are certain key elements to success. These include:

- Maintaining our knowledge base through continuous investment in research and development,
- Investing to keep our manufacturing facilities at the leading edge of technology,
- Recognizing that converting our knowledge into sales means outstanding integration of product and manufacturing process design engineering to overcome labor and capital cost advantages enjoyed by many non-U.S. producers,
- Looking beyond domestic requirements and responding to the varying global market product and service opportunities,
- Recognizing that a total creative business response is required which is multifunctional and stretches from the laboratory through engineering and manufacturing to the salesroom,
- Looking for the high quality, cost effective response combined with sales and distribution strategies that respond to the peculiarities of the many markets we must serve to justify the huge development and facility investments involved,

  and - most important -

- Having an enthusiasm to compete in the global market coupled with a desire to excel.

Certainly in our free-market economy U.S. industry has the primary responsibility to adjust to the global environment, and aggressive U.S. companies have demonstrated that they can win when the international playing field is ruled fairly.

Government support is necessary to achieve rules that treat the U.S. and all our trading partners uniformly. Incentives for product and facility investments are needed to enable U.S. producers to export into world markets. Export regulations must be consistent with our need to utilize the levels of technology required for penetrating global markets. In particular these export rules must be drafted in a way that permits smaller U.S. companies to compete without unduly taxing their resources.

Thank you.

Mr. BROWN. Thank you very much, Mr. Garry.

Mr. Garry, I'm interested in your emphasis upon the competition in the global market. That, of course, was an aspect focused on in the Packard report.

Mr. GARRY. Yes.

Mr. BROWN. That we're competing in a global marketplace. Your company is one of those that are described as multinational or international corporations.

Mr. GARRY. Um hum.

Mr. BROWN. And that of course gives you a global perspective. I'm interested in the degree to which this global perspective has helped you to overcome some of the problems that may have developed over time in some of—more parochial companies that weren't so much interested in global markets.

Mr. GARRY. Well, I think in particular that when you're focused on the total marketplace, your idea of what it takes to win in that marketplace is sharpened, as contrasted to when you're looking at a smaller and more restricted market. I thought that was brought out by the speakers on quality here earlier. But the idea of competing in a global marketplace means that you have to meet not only cost objectives, but also the quality objectives. That you have to design products which have utilization, which are usable in that market, and then you have to find a way in which other people can afford to buy what you have to sell, which led to the share-to-gain idea among other things.

But I think most importantly having a global perspective allows you to understand that you are in fact competing against all sorts of manufacturers, any one of whom can probably enter into your marketplace. We believe—as a nation we believe in the free exchange of information. That a free flow of information is important. So whatever investments we make in technology, itself, particularly in research activity, those findings are available to the world as a whole, and you have to accept that. And therefore you have to recognize that anybody with an ability to comprehend can be a competitor, so you deal on that basis.

Mr. BROWN. Gives you a healthy discipline, doesn't it?

Mr. GARRY. It certainly does.

Mr. BROWN. There was an interesting article in the Washington Post, I think on Sunday, painting a picture of what's happening in Japan that was a little different from what we normally see. It actually indicated that there may be a decline in the Japanese economy resulting from their failure to exercise some of the practices that you've just described.

Mr. GARRY. Um hum.

Mr. BROWN. For example, it mentioned that they're running up against a roadblock because they're exploiting the Chinese markets——

Mr. GARRY. Yes.

Mr. BROWN [continuing]. And not trying to cooperate with the Chinese market. And of course, with all of their trading partners, they're making them mad because of the huge adverse balance of trade that's developed there—which can't be sustained in the long run.

Mr. GARRY. That's right.

Mr. Brown. It's not healthy.

We're talking here I think of cultural attitudes. The Japanese have always placed great emphasis upon this concept called the Japanese spirit, this cooperative relationship between management and labor and a number of other aspects of it, dedication to success and so on. But you can overdo that.

Mr. Garry. No doubt about it.

Mr. Brown. If we define that Japanese spirit in a certain way that does not include the needs of the rest of the world, it becomes counterproductive at a certain point.

Mr. Garry. That's true.

Mr. Brown. I am surprised that a huge, impersonal, profit-driven corporation can have such an enlightened view of the situation in the world. [Laughter.]

Mr. Garry. A large corporation does not necessarily have to be impersonal. I came out of the aircraft industry which has an international kind of viewpoint, I believe. And I think that we recognized very early here that, as you say, that you have to serve a customer and you have to recognize his needs as well as your own. And in many instances, you're almost getting into a barter position in order to achieve your own ends.

I think you have to be very careful never to underestimate the power of the enemy, and the Japanese are quick to change. They're capable of change. You see efforts of the Japanese today to form joint ventures and other activities in the United States and elsewhere. But, cultural change comes slowly, but it does come.

Mr. Brown. All right. I'm not picking on you, Mr. Garry. [Laughter.]

I want to get back to Mr. Beilman for a moment, also. Mr. Beilman, you have advanced an extremely important idea about what's necessary to keep us ahead of the world in microelectronics. And this committee has been extremely receptive to suggestions about what needed to be done along the lines that you've been talking about. You know we had a little fad about the need for more support for supercomputers here and I think we helped push that program along a little bit, and we've I think contributed to the NSF's support for these engineering research centers and some other initiatives of this sort.

Now, if what you say is true, this committee perhaps ought to be trying to examine those suggestions and seeing if we could contribute to the development of that kind of a complex national facility to help us move into this next generation of ultra—what do you call them?

Mr. Beilman. Ultra-large-scale integration.

Mr. Brown. Ultra-large-scale integration. But we don't want to do it just on the parochial basis of helping Research Triangle Park. Are you suggesting the kind of a system, an organization here, which would be truly national and that would involve the cooperation of the entire research community in a focused effort that would be centered on an expanded operation there in Research Triangle Park?

Mr. Beilman. Yes. I think it's an opportunity to enlist the involvement of a wide range of universities that have enormous capabilities in the basic areas related to this field and to involve a broad range of national companies, large and small, who work in this unique environment.

Mr. **Brown**. The research itself would not necessarily all have to be done at Research Triangle Park, if I understand this——

Mr. **Beilman**. That's correct. The concept is that the research that's being sponsored currently at the universities would be enhanced and selectively brought to à full manufacturing research environment to further qualify it and condition it and to provide feedback to the universities of what must be done in order to make it a useful industrial contribution. It must have the industry people working in that facility, as we have in ours, in order to provide that special understanding that only comes from industry. Universities are not major developers of technology, but they must be coupled more closely with the research of industry.

Mr. **Brown**. We understand the importance of that. And of course, it is something that we have been encouraging, to get this cooperation between the university and industry research and other capabilities.

I have a recollection that we're supporting already some submicron research facilities in other parts of the country. Am I correct in this?

Mr. **Beilman**. We don't know of any support from the Federal Government going into commercial submicron activities to date. Most of the work that's being done relating to that would be through either the National Laboratory work which may have derivative value here or through some of the military programs in the very high-speed integrated circuit program, or VHSIC. But I'm not aware of any focused commercial support in this field from the Federal Government of any significance.

Mr. **Brown**. Now you've mentioned that your focus here is on commercial applications of this development.

Mr. **Beilman**. Yes, sir.

Mr. **Brown**. The driving force today is in the Defense Department and coming, a lot of it, through the SDI Program which foresees the need for exactly the kind of capabilities that you've developed, as you say, for a commercial market there. Are you untainted by SDI funding down there?

Mr. **Beilman**. We do not have any SDI funding. Having come from a commercial operation, also with extensive, 20 years of research and development and production in military electronics, there's a substantial difference. You know, if you're going to compete in the commercial international marketplace, you must develop lower costs at adequate necessary qualities for the commercial market, and the defense industry focus is on the highest reliability and not necessarily compatible in all respects, although there is much we think could be derived from the basic work going on with defense. But we do not see any vehicles today that effectively couple the military defense work to the commercial requirement.

Mr. **Brown**. Well, what Federal mechanism do you see as being the most likely source for providing the kind of funding source in perhaps some organizational framework for what you're proposing here? Is it compatible—what I'm trying to determine, could this be a spinoff from what NSF is doing with the Engineering Research Centers, for example?

Mr. **Beilman**. Well, we view the Engineering Research Centers as another source of the technology to bring into this neutral environment, much as a National Laboratory would provide. We have not tried to identify who would be the specific sponsor. I think it could be regarded as appropriate for DARPA, for example, because of the close, intimate relationship of maintaining defense capability without having a commercial capability. The general feeling today is, if we lose our commercial capability, we'll ultimately lose our defense capability, so DARPA could be a significant factor. We believe the National Science Foundation could be also logical because of the intense involvement of the scientific approach in order to bring this technology to fruition. And we think that the other departments would be also interested in making contributions because it provides an opportunity for other Federal investments in the National Laboratories. For example, in Department of Engineering—Energy, rather—to take the work coming from Brookhaven or from Sandia, and by bringing people into this environment on a sabbatical basis, or whatever, to provide, in essence, some effective new funding.

Mr. **Brown**. All right. Have you done anything in the way of formulating specific proposals other than what's contained in your statement here this morning? In other words, could we get some additional background on this?

Mr. **Beilman**. Yes. We have some we intend to provide as an appendix. I have had the opportunity to review this with the Office of Science and Technology Policy, the Office of Technology Assessment, individual members of the committee, and with industry leaders, and there is a growing interest and we are beginning to flesh out more of the details as we get more input and advice from these various organizations.

Mr. **Brown**. We would appreciate your supplying the committee with such material that you feel would be appropriate dealing with this.

Mr. **Beilman**. Be pleased to do so.

Mr. **Brown**. All right. Gentlemen, in recognition of the fact that we're already well into the lunch hour, I'm going to defer any further questions. But I would like the opportunity to submit any questions to you in writing that we might want.

Mr. **Beilman**. Certainly.

Mr. **Garry**. Um hum.

Mr. **Brown**. And I have been very greatly impressed by the statements both of you have made. We may not be in such a hopeless situation as we sometimes think we are.

Mr. **Beilman**. I don't think so.

Mr. **Brown**. Thank you very much. And the subcommittee will be adjourned until tomorrow at 9:30 a.m.

[Whereupon, at 12:32 p.m., the subcommittee was adjourned, to reconvene at 9:30 a.m., Thursday, June 26, 1986.]

[The prepared statement of Mr. Pat Choate, director of policy analysis, TRW Inc., follows:]

Statement

of

Pat Choate
Director of Policy Analysis
TRW Inc.

Before

The Subcommittee on Science, Research and Technology
of the
Committee on Science and Technology

U.S. House of Representatives
Ninety-Ninth Congress
June 25, 1986
Washington, D.C.

Mr. Chairman and Members of the Committee:

I am pleased to have this opportunity to share with you my thoughts on H.R. 3997, the National Policy and Technology Foundation Act, and the important national problem it addresses: namely, the declining competitiveness of the American economy. And in fairness to you and my employer, TRW Inc, I note my comments this morning do not necessarily reflect any opinion or position other than my own.

I will limit my comments to one of the nine branches of this proposed foundation -- the National Office of Policy, Analysis and Assessment.

As your hearings have reveal, the decisions of American government influence the competitiveness of U.S. firms and workers in many ways. In a January 1985 Harvard Business Review article, Grady Means estimates that half of all actions taken by business are in direct response to the decisions of government. Government policymaking has not kept pace with this reality.

This failure is critical the American system of government splinters power by design. Authority in Congress, for example, is divided among 8 select and special committees, 38 full committees and 242 subcommittees. The splintering of power in Congress parallels a similar fragmentation in the executive branch. Since the New Deal, dozens of new agencies and programs have been created, often with little regard to what already existed. Power in the executive branch is now atomized among 8 major offices within the Executive Office of the President, including the Office of Management and Budget; 13 departments, 55 independent agencies and government corporations and hundreds of individual programs.

Of course, most major decisions in government require action by both the executive and legislative branches. The likelihood of securing agreement in this environment of fractured accountability is slim. Modifications in federal pension policies, for instance, involve 10 cabinet departments, 25 operating groups within these departments, and 119 congressional committees and subcommittees. Shifts in economic policymaking implicate 33 separate agencies and departments outside the White House.

Decisions about U.S. trade policies are divided among the United States Trade Representative, the Office of Management and Budget, the Council of Economic Advisers, the Secretary of Commerce, at least 25 other departments and agencies in the executive branch and 19 committees and subcommittees of the Congress.

These examples are neither unique nor extreme. They reflect the way that our government operates.

The complex, fragmented structure of the federal system protects each of us against tyranny. But it also slows decisionmaking and diminishes government's ability to address issues, even those that are crucial to our national well-being such as declining U.S. competitiveness.

The gridlock, duplication, delays, omissions and unintended consequences that now impede government and harm our nation's competitiveness cannot be altered by simplistic nostrums such as eliminating government, centralizing power, or abdicating public responsibilities. Massive government reorganization is yet another sterile approach to improving policymaking or programs.

Moreover, reorganization is typically a waste of time, a source of delay and a poor substitute for substantive action. Since 1948 there have been 29 major, but unsuccessful, attempts to restructure and consolidate federal economic policymaking in the executive branch; such authority is now delegated to 33 separate departments and agencies outside the White House.

Techniques of politics and governance that will permit flexible, speedy decisionmaking and simultaneously preserve open and democratic government are the most practical means of improving government decisionmaking. Fortunately, there is great latitude for innovative policymaking and better management in the complex system of American government.

President Ronald Reagan, for example, has imaginatively broken several major political gridlocks by appointing bipartisan commissions that worked outside the formal structure of government to devise proposals which are then brought to the President and Congress for ratification. Bipartisan commissions helped break the political impasse on sensitive issues such as Social Security reform, deployment of the MX missile and the Caribbean Basin Initiative.

Governors, local officials and citizens are also creating public policies and political solutions outside the normal political processes. Referenda that permit policymaking through the ballot box are one such technique. Among the first and certainly best known of these referenda was California's tax-cutting Proposition 13 in 1978. More than 300 state initiatives were considered in the 1984 elections. Many were far-reaching: 33 attempted to change state tax structures, 17 were designed to limit and alter the power of state legislatures, and 46 sought to change laws on social issues such as abortion and interracial marriage.

While special commissions and public referenda are important policymaking tools, they often take months, even years to effect change. They are plainly inappropriate for decisions that must be made with flexibility and speed, such as those concerning the money supply or international trade agreements.

In many such circumstances, the cabinet council approach may be an effective response. During his first term, President Reagan resolved many policy differences through seven cabinet councils, each of which had primary responsibility for a different policy area -- commerce and trade; economic affairs; food and agriculture; human resources; legal policy; management and administration; and natural resources and the environment.

Each was composed of cabinet officers, had professional staff support and was chaired by a departmental head; the Secretary of Agriculture, for example, chaired the council on food and agriculture. In 1985, executive decisionmaking was further streamlined when these seven councils were consolidated into two -- a domestic policy council chaired by the Attorney General and an economic policy council headed by the Secretary of the Treasury.

Although the cabinet council approach has advantages, it also has major flaws. Agency heads, for instance, are notorious for their refusal to defer to peers, even one appointed by the President as chairman of a council. Moreover, most issues, such as trade, involve the reconciliation of multiple social, economic, defense and foreign policy issues which transcend the scope of an individual council. If flexible, timely and focused decisionmaking is to become a regular feature of government, other techniques of governance are also required.

This need has not gone unnoticed. Since 1983 there have been dozens of studies on long-term competitiveness and the need to improve the quality and focus of government decisionmaking. I analyzed 17 of those studies. They included leaders from virtually all of the leading companies (large and small), unions, academe, public policy institutes and foundations, along with hundreds of citizens.

A common feature among several of those studies was the need to improve the coherence of government decisionmaking, regardless of whether the size and influence of government is larger or smaller. Several of these studies also came to the conclusion that while some reorganization of government may be warranted, what was most important was to create a decisionmaking process at the highest level of government that would assure that issues that affect the long-term competitiveness of American business and workers were given the attention and priority they require.

The Business-Higher Education Forum, an organization of leading college presidents and business CEO's called for the creation of a Presidential Adviser on Economic Competitiveness. The task of this adviser would be to "help the President and other policy-makers focus on the diverse concerns -- such as trade and investment regulatory reform, technological innovation, and the development of human resources -- basic to an effective competition effort."

The President's Commission on Industrial Competitiveness, the Young Commission, noted that "Government decisionmaking can be strengthened significantly by providing a forum in which consensus can be reached on the facts of an issue and in which the implicit tradeoffs among policy options can be made explicit. In addition, the President would be well served by the creation of a small staff in the Executive Office of the President to study and advise him on competitiveness."

The Center for National Policy -- in a study led by Felix Rohatyn, Lane Kirkland and Irving S. Shapiro -- reported that a missing ingredient in America's competitive efforts is "an effective process for making policy decisions." They called for "An Industrial Development Board, composed of government, labor and business leaders, to advise the President and develop cooperative strategies to promote industrial growth... and help insure that government efforts do not work at cross-purposes with private efforts."

The Committee on the Next Agenda -- a Committee convened by the Administration and composed of leaders from the Brookings Institution, the Heritage Foundation, the Hoover Institution, the Hudson Institute, the American Enterprise Institute, the Institute on Research of Economics of Taxation -- informed the President that " There is an overriding need for a clearly developed and articulated comprehensive foreign economic and trade policy... The current fragmented system needs to be rationalized or replaced by mechanisms that promote the formulation of coherent, long-term and thoughtful approaches to foreign economic and trade issues."

The Committee on the Next Agenda also noted a parallel that I think interesting: namely, that the nation has long considered ad hoc approaches to national defense issues as being totally unacceptable. Accordingly, since the late 1940s a succession of President's have had National Security Advisers whose role is to coordinate the many diverse actions of agencies that affect our long-term strategic well-being, such as the Departments of Defense and State and the Central Intelligence Agency, among others.

Noting this parallel, they recommended that "a broker is needed within the Executive Office of the President to reconcile, overlapping defense, foreign, economic and trade areas. The broker role would play an important coordination function in the government, not a planning function. It should provide for the institutionalization of an economic policy apparatus that integrates domestic and international considerations, eliminates redundancies, and has sufficient authority to do the job."

The message that is being sent to the Congress and the President by distinguished by leaders from business, government, unions and academe is that government must give much more attention to how it forges economic policy and how these policies affect the competitiveness of our nation's economy. The legislation you are considering is an important step in that process. It provides high level oversight and the mechanisms that are required to collect and analyze information, secure a broad, open consideration of views and translate analysis into specific policy recommendations for the President and Congress.

Whether the coordination mechanism is located in the White House or an agency is important, but secondary to the fact that such a mechanism is required, and desperately. What is important is that your legislation would elevate the issue of trade and competitiveness to a parity with foreign policy and national defense. That has long been needed.

Equally important, your proposal would begin the long overdue process of improving the coherence of federal decisionmaking, particularly as it influences the competitiveness of U.S. industries. That too has long been needed.

In sum, the legislation you propose is central to any larger national effort to improve America's economic competitiveness.

Thank you.

STRATEGIES FOR EXPLOITING AMERICAN INVENTIVENESS IN THE WORLD MARKETPLACE

THURSDAY, JUNE 26, 1986

House of Representatives,
Committee on Science and Technology,
Subcommittee on Science, Research and Technology,
Washington, DC.

The subcommittee met, pursuant to notice, at 9:45 a.m., in room 2318, Rayburn House Office Building, Hon. George E. Brown, Jr. (acting chairman of the subcommittee) presiding.

Mr. **Brown**. The subcommittee will come to order.

We will go through the preliminaries here as quickly as possible. The chairman of the subcommittee, Hon. Doug Walgren, has a few brief and enlightening words which we will insert at this point in the record.

[The prepared opening statement of Mr. Walgren follows:]

Opening Remarks of the Honorable Doug Walgren—June 26, 1986

Today we proceed with the third day of what have been enlightening hearings on strategies for exploiting American inventiveness in the world marketplace.

We have heard rather convincing testimony on why Japan has been so successful and why the U.S. has grown comparatively less competitive since World War II. We have learned what has worked to combat this trend in specific legislative proposals, one in the trade area and one to establish a series of national quality awards similar to Japan's Deming Prizes.

Today we continue hearing from exceptionally qualified witnesses on these topics. Leading off will be the Honorable Don Ritter who has been a faithful member of this subcommittee and a leader in Republican efforts to promote high technology and economic competitiveness. He will be followed by John Mittino from the Department of Defense who will describe a DOD program to establish competence and manufacturing capabilities in areas where these are needed. We are interested in learning how this program works and its applicability to other agencies.

Finally we will have a panel made up of Professor Lodge from Harvard Business School, Howard Samuel, President of the Industrial Union Department of the AFL-CIO, and Dr. Allen Rosenstein from UCLA. All three of these men have been leaders in our Nation's rethinking of how the Federal Government should be organized to meet the challenges posed by increased competition from abroad. We look forward to sharing ideas with these witnesses as we continue to study the appropriate governmental responses to problems of competitiveness.

Mr. **Brown**. I have a few brief and eloquent words which I will read.

Today is the third and final day in a series of hearings on strategies for exploiting American inventiveness in the world marketplace. The past 2 days of hearings have been very fruitful. We have heard from a wide variety of panelists on factors which have contributed to the decline of innovation and inventiveness of American companies.

Today, the discussion will extend to proposals designed to address current problems in our Nation's technology policies and to reverse the loss of technology-oriented markets by American industry.

We will first hear from our distinguished colleague from Pennsylvania and a member of this subcommittee, Hon. Don Ritter. Mr. Ritter has been very active in discussions about American competitiveness in the world marketplace and is the vice chairman of the Task Force on High Technology Initiatives Steering Committee of the House Republican Research Committee.

We look forward to his presentation this morning.

We will then hear from John Mittino, Deputy Assistant Secretary for Production Support in the DOD and will be interested to learn how the DOD is addressing many of the concerns we have raised today.

Then on our next panel, we will hear from three distinguished gentlemen, Prof. George Lodge, of the Harvard Graduate Business School; Howard Samuel, president of the Industrial Union Department of the AFL-CIO; and Dr. Allen Rosenstein, who has been interested in this subject for more years than I hate to admit, and who is the chairman of the board of Pioneer Magnetics, Inc., and professor of engineering at the University of California at Los Angeles.

We are looking forward to all of these witnesses, and after Mr. Boehlert gives us the benefit of a few eloquent brief words, we will proceed with Mr. Ritter.

Mr. BOEHLERT. Thank you, Mr. Chairman.

Today, we will be focusing on one particular approach to improving competitiveness: The creation of a national policy and technology foundation.

This proposal has come to us through the tireless work of Prof. Allen Rosenstein, whose dedication to this issue should be emulated by us all. We can all agree, I think, with the premise of Dr. Rosenstein's proposal.

The Federal Government should focus more on the promotion and impact of new technology. I am not sure, however, that the creation of a new agency is the best way to do that, especially in this era of Gramm-Rudman-Hollings.

But, at the very least, H.R. 3997 is a worthy vehicle for discussion. It should lead us to recognize both the vital importance of technology to our economic health and how many Federal agencies now influence, measure or control the development and impact of technology.

We need that recognition before we can make intelligent policy decisions.

I am especially pleased, Mr. Chairman, that our colleague, Congressman Ritter of Pennsylvania, who was a leader in this overall area will be our first witness this morning.

Mr. BROWN. Thank you very much, Mr. Boehlert.

And now, we will hear from Hon. Don Ritter, who, as I indicated, is vice chairman of the Task Force on Competitiveness of the Republican organization. We never pay much attention to those——

Mr. RITTER. Whatever.

Mr. BROWN. Whatever.

Mr. **Ritter**. Thank you.

Mr. **Brown** [continuing]. But whose own background probably qualifies him better than any other Member of Congress to speak on this issue, and we are very pleased that he is here and pleased that he is a member of this committee.

STATEMENT OF HON. DON RITTER, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF PENNSYLVANIA

Mr. **Ritter**. Thank you, Mr. Chairman, for that gracious introduction, and thank you, Mr. Boehlert, for your interest, and I am very pleased to be a member of this distinguished panel of witnesses today, discussing this crucial issue for the future of the United States, and for the future of our economy, and for the future of our jobs and our communities.

As the vice chairman of the House Republican Task Force on High Technology Initiatives, I would like to introduce to the Members and to the public the second edition of our activity as published, targeting the process of innovation and agenda for meeting America's competitive challenge.

Suffice to say, that in the areas we have covered, basic research and development, incentives for risk-taking and capital formation, adequate supply of skilled people, and expanding market opportunities, there is much that we can do as a Congress this year and next year.

Not all of this subject is far away and blue sky, and indeed many of the 11 initiatives, 5 to be exact, are law today or in the process of becoming law, and many of the initiatives we have shared with committees like this one, with subcommittees like this one, and I would like unanimous consent that at the conclusion of my testimony, to place this series of recommendations of the Task Force on High Technology Initiatives in the record, Mr. Chairman.

Mr. **Brown**. Without objection, it will be made a part of the record.

Mr. **Ritter**. Mr. Chairman, the time has come to make a concerted Federal/civilian effort to elevate and give greater focus, coherence and continuity to the issues of America's competitiveness. These are the issues raised by the Young Commission, our House Republican Task Force on High Technology Initiatives, the Science Policy Task Force of the Science and Technology Committee, at so many of the hearings of this subcommittee, like the ones this week.

These issues need to be brought out into the light of day, and the achievements and the activities of these various groups and panels need to receive greater attention, greater focus, and greater continuity.

As things stand today, we have no existing body in Washington which can move forward effectively with some of the undeniable consensus-based ideas such as those expressed by yesterday's panel on quality in U.S. production. And the day before's panel.

I was struck by our inability to help Dr. Myron Tribus and the National Society of Professional Engineers achieve their noble, inarguable goals of making America the high-quality, low-cost producer.

Dr. Tribus advised us to ask questions in the course of our activities and investigations. That's well and good, but considering what's at stake, considering a yawning gap in the national capability and quality of industrial production, considering the accelerating export of industrial jobs as U.S. manufacturers go offshore, we need to do more.

The lack of a home for industrial competitiveness issues in Washington was recognized by the President's Commission on Industrial Competitiveness, the Young Commission, when they sought to create a new Federal Department of Science and Technology. They also knew of the difficulties involved in such a major reorganization.

While I don't believe that the impetus is there, or here, for such considerable rearrangement, and I don't believe our record of success in reorganizations in Washington is so encouraging as to proceed with such a big one, there is a lot that can be done between creating a new Cabinet level department and the virtual zero level of a coordinated approach to science, technology, and industrial research related to competitiveness that we have now.

The hard fact remains. National/global issues must have some national/global response from the United States. Our single enterprises need help from our national government when dealing with the challenges and opportunities presented by foreign producers who are either government-based or government-backed. That's a fact of life in the global marketplace which cannot be denied and which needs some response.

Those political responses derived mainly from frustration could be self-defeating in the long run. New forms of partnership—with the Federal Government, seeking to boost our side's ability to compete, provide level playing fields and open doors for us—are essential.

To further this new partnership, whereby federally-developed technology is better transferred to the private sector, and to focus on the whole gamut of issues of innovation, commercialization and competitiveness, I am personally drafting a bill to establish the National Bureau of Standards and Industrial Competitiveness [NBSIC] out of the existing NBS as the Federal Government's primary institutional focus on industrial competitiveness issues.

I envision an NBSIC entity which gives a civilian home to the presently homeless. Mitch Snyder, the activist, has been voted a center. Now, it is time to have a home and a center and an impetus to newly emerging Federal efforts in the manufacturing sciences and technologies, and other industrial competitiveness projects which for so many years have languished, and only today are emerging, but as foster children in foster homes.

The NBSIC will seek to bring together under one roof, so to speak, a significant portion of the presently dispersed and consequently weak efforts in the field: appropriate ongoing efforts in science, technology and policy studies related to competitiveness.

In creating NBSIC, we seek to structure an organization that, while Federal in origin, is essentially motivated, driven, and eventually funded by the private sector players who ultimately must respond to the competitive challenge.

Why IC combined with NBS? The National Bureau of Standards is the natural home of such efforts. Their record of working with American industry on cutting edge applications of science and technology is excellent. Their orientation to problems faced by the private sector is greater than any other Federal agency. Their interdisciplinary capabilities, their superb facilities, their excellent staff, all serve well as a starting base for NBSIC.

Indeed, such an infusion of new challenge can serve to invigorate a flagship operation which has been buffeted by budget exigencies in recent years.

Mr. Chairman, there are many excellent features of your bill, H.R. 3997, which could be incorporated into the functions of an NBSIC, although I would hasten to add that NBSIC would take a more modest, more nuts-and-bolts approach to the competitiveness challenge.

Nevertheless, H.R. 3997 does yeoman service to this emerging debate and the issue documents supporting it should be required reading for all Members of Congress.

Mr. Chairman, I wish to personally thank you for your pioneering efforts and your creative vision which brings so much to this crucial debate. I look forward to working closely with you and other members of this committee in the upcoming weeks as we finalize our proposals for creating the National Bureau of Standards and Industrial Competitiveness.

Thank you. [See Appendix for the prepared testimony of Mr. Ritter.]

[The recommendations of the Task Force on High Technology Initiatives follow:]

Targeting the Process of Innovation

second edition

An Agenda for Meeting America's Competitive Challenge

Recommendations Prepared By:
The Steering Committee of
The Task Force on High Technology Initiatives
House Republican Research Committee
U.S. House of Representatives
December 1985

The High Technology Industry Group at Deloitte Haskins & Sells is a leader in providing audit, tax and management consulting services to high technology companies. We believe that the future success of American high technology companies will be a major factor in keeping the United States competitive in world markets and will be a key element in our future growth. We are pleased to participate in the distribution of this booklet, *Targeting The Process of Innovation,* and enthusiastically encourage the support of the government in providing incentives to promote the continued growth of the high technology industry.

John W. Peth, Partner-in-Charge, High Technology Industry Group, DH&S, San José, CA, (408) 998-4000.

House Republican Research Committee
Honorable Jerry Lewis, *of California*, Chairman
B. Robert Okun, Director

Task Force on High Technology Initiatives
Steering Committee

Honorable Ed Zschau, *of California*, Chairman
Honorable Don Ritter, *of Pennsylvania*, Vice Chairman
Honorable Sherwood H. Boehlert, *of New York*
Honorable Rod Chandler, *of Washington*
Honorable Tom DeLay, *of Texas*
Honorable Cooper Evans, *of Iowa*
Honorable Hamilton Fish, Jr., *of New York*
Honorable Judd Gregg, *of New Hampshire*
Honorable Nancy Johnson, *of Connecticut*
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Executive Summary

America's challenge today and for the future is to create enough new and satisfying jobs to employ our growing work force and to increase the standard of living for all Americans. The key to meeting this challenge is industrial competitiveness — our ability to develop and produce high quality goods and services at prices that are attractive to both foreign and domestic consumers.

Under President Reagan's leadership, our country has entered an era of prosperity that has not been experienced in two decades. However, some U.S. industries have been outpaced at home and abroad by more aggressive competitors. This has cost American jobs and has created a national awareness of the reality of global competition.

Some suggest that the best way to preserve American jobs is for our government to erect protectionist "fences" to limit foreign imports. We disagree.

We believe a far better policy is one that encourages America's workers and industries to rise up and meet the competitive challenge. Our primary problem is not the surge of imports, which always rise with strong U.S. economic growth. It's a lack of American exports. America can increase jobs and exports, but it can only do so by becoming more competitive.

U.S. leadership in technology and its applications has been a primary source of increased productivity, exports, and new jobs in the past. In order to strengthen our nation's competitiveness, government must minimize the barriers to innovation and productivity that exist in statutes and regulations. However, it is important to keep in mind that innovation and the creation of new technologies cannot be *forced* by government "targeting" of selected industries. Rather, economic growth and prosperity result from the vision and genius of individuals who have the financial resources and courage to take risks in exploring new ideas. As such, innovation can only be *fostered* by government policies that promote free enterprise and entrepreneurship.

We believe the proper role of government in helping American workers and companies meet the competitive challenge is to *target the process* by which new ideas and products are developed — *the process of innovation*. That is, our government should focus on removing unnecessary obstacles to growth to help create an environment in this country in which innovation, new ideas, and new companies are likely to flourish and in which firms in mature industries can modernize. Making sure that such an environment exists is the best way government can help America increase its leadership in technology, jobs, and exports.

There are four conditions needed for an environment that promotes innovation:

- *A strong commitment to basic research and development,* to deepen and broaden our understanding of fundamental processes that will form the basis for industries, technologies, and products in the future;
- *Incentives for risk taking and capital formation* to promote the investment and innovation necessary for making technological advances, developing new products, establishing new companies, and rejuvenating mature industries;
- *An adequate supply of skilled people,* that provides a broad base of educated and well-trained citizens who can meet the challenges of a rapidly changing world;
- *Expanding market opportunities,* domestic as well as foreign, which requires a healthy domestic economic environment and aggressive trade policies.

The proper government policy for creating jobs and promoting exports is one that focuses on enhancing these prerequisites for innovation. It consists of specific legislative and regulatory initiatives that foster these conditions and avoids government actions that would weaken them. The specific initiatives needed will vary as actions are taken and events unfold, but there are specific actions that can and should be taken right now.

The following Agenda for Meeting America's Competitive Challenge contains 11 legislative initiatives that we believe the 99th Congress should enact to strengthen the prerequisites that are fundamental to the process of innovation. We have limited the Agenda to proposals that we think can and should be implemented in 1986. In developing this Agenda, the Steering Committee has consulted with over 60 experts in industry, government, labor, and academia in an effort to develop proposals that would be the most effective. The Steering Committee gave special consideration to the recommendations of the President's Commission on Industrial Competitiveness (PCIC). Five of the Commission's recommendations are endorsed in this Agenda. In addition, several proposals are identical to those presented in the Trade Partnership Act that was introduced by House Republicans on October 8, 1985.

BASIC RESEARCH & DEVELOPMENT
RECOMMENDATION

- Amend the Stevenson-Wydler Act to streamline and make uniform the procedures used by federal and national laboratories for entering into cooperative research and development agreements with private and local government entities, and provide greater monetary incentives for laboratories and their employees to transfer their technologies to the private sector.

INCENTIVES FOR RISK TAKING AND CAPITAL FORMATION
RECOMMENDATIONS

- Reform the tax code to reduce the cost of capital and improve those tax provisions that affect savings, investment, and productivity.
- Make permanent the research and development tax credit, and broaden its applicability to cover computer software and start-up companies.
- Permit enforcement of a domestic process patent against a product made by the patented process without proper authority in a foreign country.
- Amend the Freedom of Information Act by requiring that owners of proprietary information filed with the federal government be given the opportunity to challenge requests made under the FOIA for that information before it is released.

ADEQUATE SUPPLY OF SKILLED PEOPLE
RECOMMENDATIONS

- Create new incentives for worker retraining such as liberalizing Individual Retirement Account (IRA) rules, or forming similar Individual Training Accounts (ITAs), to allow individuals to set aside and later withdraw from their savings without penalty or taxation funds to pay for retraining.
- Permit participation of displaced workers in employment training programs without preventing them from receiving unemployment compensation.
- Continue to permit foreign nationals, educated in the U.S. in skill shortage areas such as science and engineering, to remain and work here after receiving their education if a position cannot be filled by a U.S. citizen.

EXPANDING MARKET OPPORTUNITIES
RECOMMENDATIONS

- Amend the Trade Act of 1974 to require that the International Trade Commission (ITC) report recommendations under Section 201 directly to the U.S. Trade Representative (USTR), and permit the USTR to provide interim relief pending the outcome of a Section 201 case.
- Amend Section 301 to clarify that the United States will consider the full range of competitor nation's trade practices when seeking trade reciprocity, and shorten the timetable for a decision on determining whether unfair or discriminatory practices exist.
- Substantially reduce the federal budget deficit by cutting spending.

Technology, Jobs, and Exports

America's Challenge: Global Competition

America's challenge today and for the future is to create enough new and satisfying jobs to employ our growing work force and to increase the standard of living for all Americans. The key to meeting this challenge is industrial competitiveness — our ability to develop and produce high quality goods and services at prices that are attractive to both foreign and domestic consumers.

Under President Reagan's leadership, our country has entered an era of prosperity that has not been experienced in two decades. Crippling inflation and unprecedented high interest rates have been reduced. Employment in the United States has reached record highs while job creation in many other industrialized countries has stagnated. In addition, growth in investment and research and development (R&D) expenditures by U.S. industry has reached rates not experienced in three decades.

However, some U.S. industries have been outpaced at home and abroad by more aggressive competitors. The following trends have brought trade policy to the political forefront:

- The United States' share in total world exports has steadily declined from 21% in 1960 to 12.6% in 1984.
- The U.S. trade deficit for 1985 is now approaching $150 billion, and the trade balance in manufactured goods has moved from a surplus of $11 billion in 1981 to a deficit of

$81 billion in 1984 — an unprecedented deficit equal to 10% of the value of manufacturing output.

- The volume of U.S. manufacturing exports in 1984 was 14% below the 1981 level, and has remained virtually unchanged since the 1981-82 recession.[1]

Since every $1 billion in exports creates approximately 25,000 jobs,[2] it is clear that many more Americans could be working if the United States were more competitive.

America Must Meet Its Competitive Challenge

Some suggest that the best way to preserve American jobs is for government to erect protectionist "fences" to limit foreign competition in the United States. We disagree.

We believe that a far better alternative to protectionism is a policy that encourages America's workers and industries to rise up and meet the competitive challenge. Our primary problem is not the surge of *imports,* which always rise with strong U.S. economic growth. It's a lack of American *exports.* America can increase jobs and exports, but it can only do so by becoming more competitive.

In order to strengthen our nation's competitiveness, government can help by minimizing the barriers to innovation and productivity that exist in statutes and regulations. U.S. leadership in technology and its applications have been a primary reason for increases in productivity, exports, and new jobs in the past. However, it is important to keep in mind that innovation and the creation of new technologies cannot be forced by government "targeting" of selected industries. Rather, economic growth and prosperity result from the vision and genius of individuals who have the financial resources and courage to take risks in exploring new ideas. As such, innovation can only be *fostered* by government policies that promote free enterprise and entrepreneurship.

Results From the First Task Force Agenda

The work of the Task Force to foster growth and exports began in the 98th Congress. In May 1984, we proposed 14 legislative initiatives aimed at fostering U.S. leadership in technology and industrial competitiveness. The following seven of those initiatives are now law:

- "Increase emphasis on civilian basic research as recommended in the President's FY85 budget" (enacted in several public laws).
- "Modify antitrust laws to require that R&D joint ventures be judged by their competitive effects only and reduce the potential liability for damages from treble to actual damages" (Public Law 98-462).
- "Make permanent the moratorium on Treasury Regulation Section 861.8" (Public Law 98-369 extended the moratorium until December 31, 1985).
- "Extend intellectual property law to include semiconductor designs and masks" (Public Law 98-620).
- "Create a new export incentive to replace the Domestic International Sales Corporation (DISC) that the U.S. has agreed to discontinue" (Public Law 98-369).
- "Instruct our trade negotiators to seek elimination of trade barriers and extension of the GATT (General Agreement on Tariffs and Trade) to cover investments and services" (Public Law 98-573).
- "Focus and streamline export controls so they are more effective in preventing the trade-related transfer of militarily critical technologies to our adversaries while avoiding unnecessary obstacles to exports" (Public Law 99-64).

Government Should Target the Process of Innovation

In this second agenda, our philosophy remains the same: We believe the proper role of government in promoting industrial competitiveness is to *target the process* by which new ideas and products are developed — *the process of innovation.* That is, our government should focus on reducing the statutory and regulatory obstacles to help create an environment in this country in which innovation, new ideas, and new companies are likely to flourish and in which firms in mature industries can modernize. Making sure that such an environment exists is the best way government can help America increase its leadership in technology and industrial competitiveness.

There are four conditions needed for an environment that promotes innovation:

- *A strong commitment to basic research and development,* to deepen and broaden our understanding of fundamental processes that will form the basis for industries, processes, and products in the future;
- *Incentives for risk taking and capital formation* to promote the investment and innovation necessary for making technological advances, developing new products, establishing new companies, and rejuvenating mature industries;
- *An adequate supply of skilled people,* that provides a broad base of educated and well-trained citizens who can meet the challenges of a rapidly changing world;
- *Expanding market opportunities,* domestic as well as foreign, which requires a healthy domestic economic environment and aggressive trade policies.

The proper government policy for industrial competitiveness is one that focuses on these prerequisites for innovation. It consists of specific legislative and regulatory initiatives that foster these conditions and avoids government actions that would weaken them. The specific initiatives needed will vary as actions are taken and events unfold, but there are specific actions that can and should be taken right now.

A Competitiveness Agenda for 1986

A STRONG COMMITMENT TO BASIC RESEARCH AND DEVELOPMENT

Research is the essential underpinning of technological development throughout the world. We are strongly committed to assuring that the United States retains a leadership position in research. However, America must focus on how we can move beyond our present achievements, and meet the challenges of a rapidly changing global economy.

The Steering Committee noted a lack of consensus among those who reviewed earlier drafts of this Agenda regarding both the direction that federal science policy should take and whether current R&D programs are meeting national needs. In order to achieve greater consensus on these critical issues, we will conduct next year a thorough review of federal policies for setting research priorities and appropriating R&D funds to the many competing projects. In particular, the following questions should be addressed:

- *Where is the U.S. R&D effort heading?* Considering that the U.S. lags behind Japan, West Germany and other nations in civilian R&D as a fraction of gross national product,[3] we need to determine whether a better balance in research programs needs to be achieved to meet the competitive challenge.
- *Who sets U.S. R&D priorities?* Given that many different interests compete for limited funds, facilities, and other resources that are required to conduct successful basic research programs, we need to determine if Congress and executive agencies can improve their methods of allocating R&D dollars.
- *Is talent being wasted?* The Steering Committee has observed that considerable time and effort is spent by researchers in "grantsmanship" — the securing and retaining of funding from federal agencies. We seek to examine ways in which researchers can spend more time on research with fewer concerns about R&D budgets and grants.
- *Where do universities fit in?* Several of the experts who helped formulate our recommendations noted that academic

research facilities, where much of American science is carried out, are becoming increasingly obsolete. These facilities function as a focus for research that not only expands scientific and technological frontiers, but also provides training for future scientists and engineers. We need to find cost-effective ways to correct this problem.

- *Can federal and national laboratories be better utilized?* The Steering Committee believes we can do a better job of promoting utilization of federal research resources.

Making Federal Labs More Effective

A major step to improve the effectiveness of federal and national laboratories was taken with the enactment of the Stevenson-Wydler Technology Innovation Act in 1980. Section 11 of this Act mandates that federal laboratories transfer federally originated technology to state and local governments and to the private sector.

During the five years since the passage of the Act, there has been increasing interest in this country in harnessing American inventiveness in ways that help the American economy. It appears that the desire of industry, universities, non-profit organizations, and units of state and local governments to cooperate with the federal laboratories in programs of mutual interest has increased significantly.

The federal government funds approximately half of the U.S. total research and development, and much of this work is performed in government-owned laboratories. The national interest demands that these federal laboratories be more responsive to our economic need for their new technologies. These technologies must be transferred more effectively from the federal sector and translated into new commercial products and processes.

Our experience under Stevenson-Wydler has made the need for legislative changes apparent in a number of areas. Currently, there is a wide variance in the ability of government laboratories to enter into cooperative research and development arrangements with the private sector, universities, and other interested parties. Laboratories in some agencies are reluctant to enter into cooperative arrangements because of the cumbersome, time-consuming process that is required. Other agencies have little or no statutory authority upon which to base such working relationships.

Even though Congress needs to make further investigations into the effectiveness of federally funded laboratories, we believe that legislative changes are needed now to improve the ability of the federal laboratories to identify innovations with commercial potential. In addition, incentives for improving technology transfer to the private sector can be enhanced by returning a portion of the royalties derived from commercialized, lab-developed technology to the laboratory. Such funds could be used to reward laboratory employees or to finance projects that Congress has not adequately funded.

BASIC RESEARCH & DEVELOPMENT
RECOMMENDATION

- Amend the Stevenson-Wydler Act to streamline and make uniform procedures used by federal and national laboratories for entering into cooperative research and development agreements with private and local government entities, and provide greater monetary incentives for laboratories and their employees to transfer their technologies to the private sector.

INCENTIVES FOR RISK TAKING AND CAPITAL FORMATION

Beyond the research stage, innovation occurs when there are adequate incentives and financing for risk taking and entrepreneurship so that new ideas and technologies will be pursued. Here, tax policy, intellectual property rights, and regulations play a significant role.

Tax Policy

In examining the root-causes of the trade deficit and the ingredients necessary for the U.S. to increase its competitive edge in the world marketplace, one issue consistently emerges: the cost of capital. According to a study by George Hatsopoulos for the American Business Conference, the cost of capital for

U.S. businesses was more than twice as high as in Japan during 1961-83. Today, capital costs for 10-year corporate development projects are four times greater in the United States than in Japan.[4] An analysis of capital costs by the President's Commission on Industrial Competitiveness (PCIC) found an important linkage between the cost of capital and productivity gains in industrialized nations.[5]

Recent studies indicate the relationship between tax policy and capital costs. A report by the Institute for Political Economy states that taxes in the United States raise capital costs by 45%, and adopting Japan's tax system would lower capital costs by 16%.[6]

We agree with the PCIC that a primary reason for the high cost of capital in the U.S. is that the tax code favors borrowing and debt instead of saving and investment. A recent study published by the National Bureau of Economic Research finds that the differences among industries' tax rates may have greater competitive consequences than the overall level of taxation. Interestingly, manufacturing industries — the sector most pressured by foreign competition — has an effective tax rate of 46%. This is one and one-half times higher than in wholesale and retail trade and more than four times the rate experienced by all other industries.[7]

The interest in the country today in reforming the tax code offers a rare opportunity to enact a simplified tax law that would substantially improve the U.S. trade position by lowering capital costs and improving savings and investment. In many ways, tax reform is the most important *trade* legislation that will be considered in the 99th Congress. However, if Congress doesn't focus on the effect that the tax code has on the cost of capital and U.S. competitiveness, it is quite possible that a new tax reform plan could further aggravate the present situation.

We believe that encouraging economic growth by lowering the cost of capital should be *the* primary objective of Congress in reforming the tax code. In particular, Congress should make a special effort to:

(1) lower marginal tax rates on both personal and corporate income;

(2) lower the capital gains rate (nine competitor nations in Western Europe and the Pacific Rim have no taxation of capital gains on stock investments);[8]

(3) improve tax incentives for research and development;
(4) improve depreciation schedules to encourage greater corporate investment.

The Steering Committee is not recommending a specific tax reform proposal. However, we will work to insure that changes made in these areas have the net effect of encouraging capital formation and, thereby, strengthening the U.S. trade position and industrial competitiveness.

While working toward a pro-capital formation tax reform law, it is essential to keep in mind important provisions in the present tax code that will expire before any tax reform takes effect. One such provision is the research and development tax credit, which expires on December 31, 1985.

The R&D credit was enacted in 1981 as part of the Economic Recovery Tax Act (ERTA). It enables businesses to take a 25% credit on *increases* in R&D expenditures over the average amount of the previous three years. In the four years since the credit was enacted, industrial R&D as a fraction of gross national product has increased 23% compared to the four years prior to 1981. A statistical analysis of corporate R&D as a fraction of GNP found that corporate R&D in the 1980s is much higher than would be expected based upon trends from the 1960s and 1970s.[9] A Joint Economic Committee study in August 1985 concluded that "empirical evidence on whether the tax credit has stimulated R&D spending tends to support the position of those who advocate continuing the credit."[10]

In 1984, the Senate passed legislation that would have made permanent the R&D credit and expanded it to cover start-up companies and computer software while refining its applicability to eliminate abuses. Unfortunately, the provision was dropped by a House-Senate conference committee.

In the 99th Congress, 246 Members of the House and 33 Senators have cosponsored similar legislation. We recommend that the credit be made permanent and refined as proposed last year by the Senate. (Both of our tax initiatives are consistent with recommendations of the PCIC.)

Proprietary Rights

Incentives for risk taking, which are needed to remain competitive, can be encouraged by insuring that rights to intellectual property and trade secrets are adequately protected. In examining this issue, the Steering Committee has found that U.S. process patent law can be improved.

Process technology is especially important in biotechnology and certain other emerging industries. In biotechnology, inventions frequently involve processes or the manipulation of micro-organisms. Fledgling biotechnology firms such as the Liposome Company have stated they will never be able to recover their R&D expenses if foreign competitors continue to manufacture abroad using U.S. patented processes without proper authorization.[11] Current law permits products manufactured in this way to be imported into this country with impunity.

Process patent protection is important to other industries, too. According to the American Flint Glass Workers Union, inadequate protection of patented processes has cost their industry at least 50,000 jobs.[12] The Oil, Chemical and Atomic Workers International Union has expressed similar concerns.

Large U.S. manufacturers which hold important patents on processes for making amorphous metal alloys and optical fiber waveguides have been unable to obtain adequate relief in U.S. International Trade Commission cases against Japanese and West German imports. The potential U.S. markets for these two products alone are worth billions of dollars.

Our major trading partners, including Japan, West Germany, France, and the United Kingdom, have provisions in their laws similar to the legislation being proposed in the United States. We should provide at least as much protection as these countries provide.

Legislation permitting enforcement of a process patent when the goods manufactured using the process are delivered to the United States passed the House in the 98th Congress shortly before adjournment but did not pass the Senate. This legislation is needed to protect the legitimate rights of U.S. inventors, and we recommend its enactment. (This recommendation was also made by the PCIC.)

Provisions in the Freedom of Information Act (FOIA) have also been identified as allowing the abuse of proprietary rights. The FOIA was passed in 1974 to promote citizen scrutiny of government processes and provide citizens with legal rights to examine information that the government may have collected about them. Interestingly, public interest groups and journalists have constituted only a fraction of the number of information requests filed in the FOIA. The greatest uses have been businesses (both foreign and domestic) that secure information about competitors. For example, 86% of the FOIA requests filed with the Food and Drug Administration in 1982 were of a commercial nature.[13] Under present law, the business that submitted the information is not even notified that confidential business information is about to be disclosed.

This information can be very useful to competitors that wish to take a "free ride" using the ideas and technologies developed and paid for by another company. It can also provide insight into a competitor's future business plans. In either case, the FOIA should be modified to eliminate this anti-competitive side effect. This can be done by requiring that companies which submitted information to a federal agency be notified that its information is being sought under the FOIA. In addition, such companies should be afforded the opportunity to object to a competitor's "right to know" if proprietary information is at stake. Of course, a review process would need to be established to adjudicate FOIA disputes. (This recommendation was also made by the PCIC.)

Regulations

The government must avoid hindering the efficiency of industry with unnecessary regulatory requirements. Evidence is accumulating that the process of industrial innovation is now impeded by a wide range of governmental regulations. The effects of these regulations — documented by the President's Commission on Industrial Competitiveness — include increased costs of R&D, declining rates of domestic research, lowered rates of new product introduction, and shifts of research activity to facilities abroad. In particular, the risks that technologies pose to human health and the environment need to be better assessed when writing regulations. We believe that by using the techniques of risk assessment and by comparing risks, federal agencies and the public will gain a better understanding of the hazards faced and thus be able to more logically regulate them.

The Steering Committee will conduct hearings next year to identify regulations that unnecessarily impair innovation and target the most important of these for immediate change, either by rulemaking or legislation.

INCENTIVES FOR RISK TAKING AND CAPITAL FORMATION

RECOMMENDATIONS

- Reform the tax code to reduce the cost of capital and improve those tax provisions that affect saving, investment, and productivity.
- Make permanent the research and development tax credit, and broaden its applicability to cover computer software and start-up companies.
- Permit enforcement of a domestic process patent against a product made by the patented process without proper authority in a foreign country.
- Amend the Freedom of Information Act by requiring that owners of proprietary information filed with the federal government be given the opportunity to challenge requests made under the FOIA for that information before it is released.

AN ADEQUATE SUPPLY OF SKILLED PEOPLE

The vision, skill, and motivation of the American people are our nation's greatest resource in meeting the competitive challenge. The United States historically has relied on a highly trained and educated work force as one of its most important advantages in international trade. Worker skills must be maintained and improved if the United States is to compete effectively in the international marketplace.

Worker Training

Demographic changes in the work force and the introduction of new technologies in the workplace make it imperative that workers continue to learn and gain new skills all their lives. For example, in 1984 the United States had 9,400 robots in place. By 1992, that number could exceed 133,000.[14] In five years there will be as many personal computers in the federal government as there are workers.[15] Eighty percent of America's labor force in the year 2000 is already working today, but many workers may be doing very different jobs by the end of this century. It is estimated that at any one time three percent of U.S. workers need retraining.[16]

Many Americans today face the anguishing possibility that their skills will become obsolete and that prolonged unemployment will destroy their accomplishments and dreams for the future. The United States has not fully come to grips with the question of how to help workers in declining industries develop new skills and find re-employment. According to a Business-Higher Education Forum report, the United States has seriously underinvested in the skill development of its workers. Only 25 percent of unemployment aid is directed to re-employment assistance, which is much lower than in many foreign countries.[17] Under current law, most U.S. workers lose their eligibility for unemployment compensation if they enter training programs. While analysts estimate that relatively few of the unemployed (5 to 10%) can be classified as "displaced", failure to assist them will seriously impede industry's — and their own — responsiveness to change.[18] Since every one percent increase in unemployment costs the government $40 billion in revenue, worker retraining has important fiscal consequences as well.[19]

Because of the new and changing demand that will be placed on the work force, the Steering Committee believes that government policies should insure that workers have adequate opportunities to maintain competitive skills. To provide such opportunities, we recommend the enactment of two initiatives in 1986. First, new savings incentives should be created to encourage preparation for the expenses of future retraining needs. Possibilities include the liberalization of Individual Retirement Accounts (IRAs) to permit workers to withdraw their savings without penalty or taxation to pay for employment retraining. A similar proposal is the creation of Individual Training Accounts (ITAs) to accomplish the same purpose. Second, displaced workers should be permitted to participate in a certified training program without disqualifying them from unemployment compensation to which they are otherwise entitled. This would help people without a job or marketable skills to adjust to new employment demands. (This recommendation was also made by the PCIC.)

Elementary and Secondary Education

In the 98th and 99th Congresses, interest in the nation's long-term technical training and labor needs has mushroomed.

Several bills have been introduced that would attempt to assist grade schools in technical training and in offering students courses to develop computer skills. We believe that educating young people in technical areas is critically important. However, we strongly feel that major new programs and incentives should come from state and local entities and not the Congress.

A growing number of local school district officials are becoming aware of the need for changing time-honored practices to meet the challenges of today's world. We applaud those who have moved toward "merit pay" and market forces to set rewards for teachers in areas of shortage. We believe that local school districts with well-paid and well-qualified teachers best understand the needs of young people in the years ahead without the advice and counsel of Washington. An example of this understanding was indicated by a survey of teachers in Chicago which found that computer science ranks behind only discipline and the "three R's" in educational importance.[20]

College Education

One way Congress can increase the quantity of skilled people in the United States is to insure that U.S. immigration policy does not prevent technically trained foreign nationals with critical skills from working here.

In the 98th Congress, both Houses passed immigration reform legislation that would have continued to permit foreign nationals who possess science and engineering skills to remain and work in the United States immediately after completing their education here provided that an American worker could not be found for the job.

Since nearly 40 percent of graduate engineering students in American universities are foreign nationals,[21] we continue to believe that U.S. companies should be able to hire these individuals if an American worker cannot be found. Any immigration reform legislation that is considered in the 99th Congress should extend the current exemption for scientists and engineers.

AN ADEQUATE SUPPLY OF SKILLED PEOPLE
RECOMMENDATIONS

- Create new incentives for worker retraining such as liberalizing Individual Retirement Account (IRA) rules, or forming similar Individual Training Account (ITAs), to allow individuals to set aside and later withdraw from their savings without penalty or taxation to pay for retraining.
- Permit participation of displaced workers in employment training programs without preventing them from receiving unemployment compensation.
- Continue to permit foreign nationals, educated in the U.S. in skill shortage areas such as science and engineering, to remain and work here after receiving their education if a position cannot be filled by a U.S. citizen.

EXPANDING MARKET OPPORTUNITIES

Even if the United States has a strong research base, incentives for risk-taking, and skilled people, innovation and the creation of new jobs will be stifled unless there are attractive business opportunities at home and abroad. That means America must have a strong domestic economy, and U.S. businesses must have access to foreign markets. While all of the initiatives described here would strengthen America's competitive position in the world marketplace, two initiatives described below would directly improve U.S. trade.

In assessing the ability of American firms to compete in foreign markets, the Steering Committee has found that new nontariff trade barriers have increased faster than the global decrease in tariffs and freight costs. In addition to import restrictions, many governments have also increasingly provided subsidies and other targeted assistance, such as special tax treatment or relaxed antitrust laws, to promote the development of selected industries. These nontariff barriers and government targeting activities are particularly significant because of the difficulty in detecting them and countering their imposition.

The Steering Committee believes that U.S. trade laws need to be more responsive to the new realities of global competition. Industries threatened by predatory import penetration have often been granted relief only after their injuries have become irreparable. Assistance has often been granted without a plan — or hope — for recovery or readjustment. For instance, the U.S. Trade Representative has up to one year to consider petitions aimed at achieving greater market access filed under Section 301 of the Trade Act of 1974. Anti-dumping claims filed with the International Trade Commission and the Commerce Department can take even longer before final action is taken by the U.S. government.

To address these problems, we recommend enactment of amendments to Section 201 and Section 301 of the Trade Act of 1974 that would make the federal government more responsive to unfair trade practices. Section 201 should be modified to require that the International Trade Commission report its anti-dumping recommendations directly to the U.S. Trade Representative and permit the USTR to take interim relief actions pending the outcome of a case filed under that section. Section 301 should be clarified to state the United States will consider the full range of competitor nation's trade practices when seeking to remove or redress the effects of certain unfair, unreasonable, and discriminatory foreign trade practices. In addition, the timetable for a decision by the federal government on whether unfair or discriminatory practices exist should be shortened.

Our antitrust statutes are another area in which the United States has yet to fully respond to changes in global markets. As noted earlier, legislation was enacted last year with Task Force support to foster R&D joint ventures. This year, a thorough review of the antitrust laws is under way in the Reagan Administration. We support this review process and will consider advocating specific antitrust changes in future editions of this Agenda.

In addition, monetary policy is being recognized in the United States and abroad as a key factor in determining interest rates and the value of the dollar against foreign currency. We believe that our present monetary policies should be reviewed and alternative approaches analyzed and debated. The Steering Committee plans to consider the many suggestions for improving U.S. monetary policy in formulating future editions of this Agenda.

Finally, Congress and the Administration should act with a sense of urgency to reduce significantly the enormous projected budget deficits that are a source of economic uncertainty and which put upward pressure on interest rates and the value of the dollar. While recent trends in interest rates and the dollar make clear that other factors are important in addition to the deficit, we believe that enactment of the other recommendations described in this Agenda will have little significance unless the level of federal borrowing is substantially reduced. Reducing deficits should be achieved through spending cuts as well as the implementation of monetary and tax policies that permit maximum sustained economic growth. (This recommendation is consistent with the report of the PCIC.)

EXPANDING MARKET OPPORTUNITIES
RECOMMENDATIONS

- Amend the Trade Act of 1974 to require that the International Trade Commission (ITC) report recommendations under Section 201 directly to the U.S. Trade Representative (USTR), and permit the USTR to provide interim relief pending the outcome of a Section 201 case.
- Amend Section 301 to clarify that the United States will consider the full range of competitor nation's trade practices when seeking trade reciprocity, and shorten the timetable for a decision on determining whether unfair or discriminatory practices exist.
- Substantially reduce the federal budget deficit by cutting spending.

Conclusion

Technology and innovation are perhaps our nation's greatest assets in meeting the challenge of global competition. They must be strengthened. However, innovation cannot be *forced* by government — it can only be *fostered.* Innovation is fostered by creating an economic environment that emphasizes freedom of scientific and industrial activities and offers incentives to the innovators, entrepreneurs, and investors who have the talent and resources to advance and apply technology. It is fostered by people who are well-trained to meet the present and future needs of the workplace. It is fostered by a healthy economic environment and by trade policies that provide expanding market opportunities for our technology and basic manufacturing industries. Meeting the challenge of global competition should a primary policy objective of the United States.

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Mr. **Brown**. Thank you very much, Mr. Ritter.

My admiration for your eloquence has increased tremendously when you said those kind things about me.

Mr. Boehlert, do you have any questions?

Mr. **Boehlert**. No questions.

Mr. **Brown**. Let me ask just one question, Mr. Ritter.

I have read with some admiration the Republican Task Force study targeting the process of innovation. I think that I could support every one of those recommendations. I have also, of course, read the Young report and others, some that you have mentioned, and others such as the reports from the National Academy of Engineering, which have also been excellent.

Our problem does not seem to be a dirth of excellent suggestions. It seems to be generating a focus under which we can get some action.

I was struck by the fact that in the Republican Task Force you seemed to be moved by that same goal, an agenda on which we can get action on, and you stopped short of doing some of the things recommended by the Young report, for example, like the department of science and technology, which is obviously going to be more complex.

I am going to ask you to explain a little bit more why you did not see fit to recommend or to encourage that, and I wanted to point out, also, that, as a complement to the department of science and technology, the Young report also recommends a department of trade.

In fact, the two almost have to go together because, if you set up a department of science and technology, you take certain functions out of the Department of Commerce which are already in it related to science and technology, and you leave a small fraction, and that small fraction needs to be given a more noble and high priority goal than we now currently have in the Department of Commerce, and that is a goal of focusing on global trade issues. And the two would, therefore, complement each other because they would both be aimed at improving American competitiveness in global trade.

Could you just briefly indicate the thinking of the Republican Task Force with regard to not making that a high priority at this time?

Mr. **Ritter**. Well, I alluded to this in my testimony. The complexity of reorganization went beyond the complexity that we wished to engage in in our task force. We felt there were actions that could be taken now and in the near future that would contribute markedly to industrial competitiveness.

Actions as simple as reforming Federal approaches to process patents that are abused abroad. Actions as simple as reforming the kinds of access given to proprietary information under the Freedom of Information Act. Actions as simple as supporting some of the changes that have emerged out of this subcommittee and full committee on reforming the Stevenson-Wydler Act. That is still, you know—those things have yet not been accomplished, yet they are fairly near-term goals.

We see what happened with the reorganization efforts in the Department of Education, the controversies that were involved in the Department of Energy, the controversies that were involved in—

frankly, it was too big and too complex to bite off. What we were saying, however, was that something other than the present set of circumstances—what we are saying is something other than the present set of circumstances is necessary, and some of us have been trying to focus on this and have come up with a less expensive, less global response and perhaps a more doable response, somewhat that we, as members of this subcommittee and full committee, can achieve, and achieve in the not too distant future.

Mr. **Brown**. I think that is a realistic analysis. To get action on a major initiative of that sort, of course, requires wholehearted support and leadership of the highest levels of the executive branch. Probably the President would have to get involved in it, and he has other high priorities.

But, hopefully, if he is successful in securing the passage of the tax bill, and resolving some of the other issues that he is involved in, he might want to focus on this reorganization as a part of the total package of industrial competitiveness which would probably do more to keep this country preeminent than almost anything else that could be done. We could hope for that, anyway.

Thank you very much, and we certainly invite you to join the committee, Mr. Ritter, if you can spend some time here.

Our next witness is Mr. John Mittino, Deputy Assistant Secretary for Production Support, Department of Defense, and we are very pleased to have you here, Mr. Mittino, and we look forward to your testimony.

STATEMENT OF JOHN MITTINO, DEPUTY ASSISTANT SECRETARY FOR PRODUCTION SUPPORT, DEPARTMENT OF DEFENSE, ACCOMPANIED BY KENNETH FOSTER AND JOHN F. ECK

Mr. **Mittino**. Thank you, Mr. Chairman.

We have provided a written statement, Mr. Chairman, and, with your permission, I would like to provide a brief synopsis of what is in that statement so that we may more quickly get on with the discussion and the questions.

Mr. **Brown**. That is certainly acceptable, and, without objection, the full text will appear in the record.

Mr. **Mittino**. I have with me two of my staff persons, Mr. Chairman, who operate in this specific area. On my right is Mr. Ken Foster, and on my left Mr. Jack Eck.

Mr. **Brown**. Gentlemen, we welcome you. We appreciate your participation.

Mr. **Mittino**. We, the Department of Defense, welcome the opportunity to appear before you and to participate in what, is a very important aspect of what this committee is doing, and I speak specifically of the implementation of title III of the Defense Production Act.

The Department of Defense has obviously several industrial readiness program objectives and one, the main statutory foundation, is the Defense Production Act. This act, at the moment, has three active titles of an original seven.

Title I of the act provides us statutory authority for exercising priorities and allocations. That is to say, we have a statutory basis for identifying DOD contracts so that in case of a need for, guaranteed delivery of material to our systems, we have a sound basis on which to do this.

Title I of the act gives us a standing long term, very useful and very critical authority to guarantee production deliveries for defense equipment.

Title VII has to do mainly with general provisions, some administrative provisions, guidance and reporting requirements. I have left for last the most important title for my discussion this morning, that is, title III, which has to do with the expansion or new entry of production capacity and supply for items and material or for industrial capability that we consider necessary for either the equipping of the forces in peacetime or the readiness for whatever emergency might occur.

We are currently in the process now of implementing title III to acquire such capability where we are either unacceptably dependent on foreign sources of supply or we cannot rely on the private commercial market to take the risk, of making the investments that may be required.

In the long run, we want to assure the long-term availability of critical defense material.

The appropriations that are available under the Defense Production Act authorization will be used for long-term purchase guarantees of specific items and/or materials.

The first two contracts are expected to be let using title III within a few weeks, and I will say more about that in a minute.

Our current purchase guarantee activities come under the criteria established by Public Law 98-265, which is the latest Defense Production Act extension. The Defense Production Act expires this September; then, it comes up for renewal.

The following conditions must be met before we can go into title III projects and before we can let contracts. I will briefly summarize these.

First of all, the material, the metal, mineral, or the product, must be essential to the national defense; specifically in our case, it must have something to do with equipping the forces and offer potential for being ready for emergencies.

No. 2, it has to be that the industry cannot reasonably be expected to make the investment or provide the capability on its own initiative without some form of encouragement or assistance from the Federal Government; in our case, the Department of Defense.

No. 3, the purchase commitments must result in something that is cost effective, expedient, and a practical alternative. We consider all the facets in these matters which have to do with trade, the capability of our domestic industry, the various vagaries of which commodities or sectors we either are losing or gaining in, and so forth, and we try to watch all this.

In addition, the exercise of this title III authority is not intended to make investments in what might end up being excess capacity; it primarily gives us a base capacity needed for the peacetime years, so that we can meet our expenditures for end items.

To give you an idea of what the funding looks like, it is reasonably modest. We are starting up this process. There has been long and thorough planning and education within the administration and we are happy to say that we are on the road now and running.

We have $10 million for fiscal year 1985 and $31 million for fiscal year 1986.

In the first two projects, we will bring on line an industrial capability for two items specifically, high purity silicon, which has many uses, some of which could be spun off into the private sector, and an expansion of the traveling wave tube capacity. These are devices which have to do with electronic warfaresystems.

In 1986, we are looking at several other programs, and, if you wish, I can go into more detail later.

At the moment, the administration is seeking a 5-year extension of the Defense Production Act. We would welcome and encourage all support for such an extension because of the critical nature of title I and title III provisions.

That concludes my statement comments, Mr. Chairman.

I would be happy to answer questions of the committee.

[The prepared statement of Mr. Mittino follows:]

Hold Until Released
By the Committee

STATEMENT BY

MR. JOHN A. MITTINO
DEPUTY ASSISTANT SECRETARY OF DEFENSE
(PRODUCTION SUPPORT)

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
(ACQUISITION AND LOGISTICS)

BEFORE THE

SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY
COMMITTEE ON SCIENCE AND TECHNOLOGY

HOUSE OF REPRESENTATIVES

ON

JUNE 26, 1986

Hold Until Released
By the Committee

Mr. Chairman and Members of the Committee I appreciate this opportunity to appear before you to discuss Department of Defense (DoD) implementation of Title III of the Defense Production Act (DPA) of 1950, as amended.

DoD Industrial Readiness Programs have their statutory foundation in the DPA. Three titles of the DPA remain active. They are Titles I, III, and VII.

Title I - Priorities and Allocations - authorizes priorities as necessary to meet scheduled weapon system production. The DoD relies on Title I to assure timely deliveries of needed industrial resources.

Title VII - General Provisions - contains the administrative provisions of the Act, including definitions, guidance and reporting requirements.

Title III - Expansion of Production Capacity and Supply - provides financial incentives to establish or expand domestic industrial capacity in order to expedite production and deliveries or services under government contracts for the national defense.

The DoD is currently in the process of implementing use of Title III to meet the national defense, particularly in those extraordinary circumstances where we are unacceptably dependent on foreign sources of industrial supply or lack of domestic production capacity and we cannot rely on free market forces to respond in time to meet defense needs. In addition, DoD implementation of Title III is a decisive action pursued to establish or restore the technical ingenuity necessary to ensure the availability of long-term domestic industrial capabilities necessary for national defense. Title III helps stem or reverse part of the accelerating trend resulting in greater percentages of critical defense material being manufactured offshore. DoD use of Title III is not protectionism; it is an optional incentive by which we can marshall private sector resources and marketplace decisions that strengthen the defense industrial base and promote long-term survival of needed technologies. Therefore, use of Title III is a good business practice for DoD.

Appropriations available under DPA authorizations will be used for long-term purchase guarantee contracts for industrial materials. These contracts will establish or maintain a domestic industrial capacity for critical national defense products when normal market incentives are insufficient. We expect to be awarding the first two defense contracts using Title III appropriations shortly.

Our current Title III purchase guarantee activities are being carried out under the criteria established by Public Law 98-265. The DPA criteria state that except during periods of national emergency declared by the Congress or the President, the President may not execute a contract unless the following determinations are made: (1) the mineral, metal, or material is essential to the national defense; (2) without Presidential action under authority of this Act, United States industry cannot reasonably be expected to provide the capability for the needed mineral, metal, or material in a timely manner; (3) purchases, purchase commitments, or other action pursuant to this section are the most cost-effective, expedient, and practical alternative method for meeting the need; and (4) the United States national defense demand for the mineral, metal, or material is equal to, or greater than, the output of domestic industrial capability which the President reasonably determines to be available for national defense, including the output to be established through purchases, purchase commitment, or action.

Public Law 98-265 also authorized the initial DoD funding for purchase guarantees under the DPA resulting in appropriations of ten million dollars in fiscal year (FY) 1985 and thirty-one million dollars in FY 1986. We selected two projects for FY 1985: establishment of domestic high purity silicon capacity needed for military laser devices and expansion of traveling wave tube capacity needed for electronic warfare systems. Our unique needs for Title III are specifically for military applications although there is some transition of the technologies involved into commercial sectors. Contracts for the FY 1985 projects will be let after meeting a few remaining administrative requirements. We also have candidate projects selected for FY 1986 funding which have specific national defense application: high purity quartz fibers for military electronics, polycarbonate for aircraft windows, pitch-based carbon fibers for composites, and superalloy scrap recovery.

Our efforts under the DPA are to meet a number of national defense needs. In fact, the President and Secretary Weinberger have made their defense commitments to the Congress assuming that the DPA legislative authorities will remain available. Therefore, the Administration seeks a five-year extension of the DPA. For essential defense purposes, there is a clear need for long-term stability to meet budget commitments and schedules. Therefore, we seek your support in obtaining an extension of the DPA.

That concludes my prepared statement. I will be pleased to respond to any questions the Committee may have.

Mr. Brown. Mr. Mittino, you mentioned your 1986 funding for title III. What is your projection for funding down the road, 1987, 1988?

Mr. Mittino. The rough projections are, beginning with 1987, 1987 homes in at about $30 million, and then we will have the precedents set with successful cases—to move up to about the $100 million range per year, roughly. It sort of levels off at that——

Mr. Brown. That really is a fairly trivial figure for the Department of Defense, but it looks rather impressive compared to some of our efforts in the civilian area to improve competitiveness posture and to enhance our capabilities in new technology areas.

Can you—and I don't want to go into all of the aspects of the Defense Department's efforts in technology transfer and quality control, and so forth—but can you elaborate a little bit on what you see as the civilian application for this program?

Mr. Mittino. I will give you a couple of illustrations. I might say that our initial requirement is to meet the military need. It turns out very fortunately that in many cases, there is a civilian spinoff. For example, we had a project in fiscal year 1986 for super alloy scrap recovery. Super alloys have to do with cobalt, titanium, and other very expensive metals. This program will give us a practical way to excise these raw metals out of scrap. We think that certainly will have a beneficial effect for private use, and that technology then will be available for that purpose.

Everyone is beginning to be familiar with composites. These are the light-weight, high-strength, components for structures, whether they be automobiles or other vehicles, or aircraft. We have two or three projects in 1986 that will bring us online with those kinds of products.

So, there is every expectation that, although we meet the military requirement, there is a spinoff to the civilian sector which we think is very useful. It has happened before. It is fairly common knowledge that several years ago that numerical control machinery in the manufacturing domain was initially funded by DOD, the Department of Defense, and you see what happened to that.

Mr. Brown. Well, you have focused quite a bit on materials technologies, and we have a very deep concern about that situation. I am informed that we are importing some of our high-quality, high-temperature ceramic and composite parts from Japan because they are ahead of us in this particular technology field, and obviously anything that we can do to stimulate our own competitiveness in this area is going to be beneficial across the economy as a whole.

Mr. Brown. We appreciate that testimony.

Mr. Boehlert, do you have any questions?

Mr. Ritter.

The focus we are trying to develop here is how we can bring about some coordination of these very valuable activities into a more effective strategy, and I don't really expect you to—I don't consider that it is your role to—develop strategies to preserve our global competitiveness in key technology areas, but if you have any comments on that stemming from your experience in the Department, I would be remiss in not asking you to express them, or to your associates, either.

Mr. Mittino. I appreciate that.

Mr. BROWN. I recognize that you can't speak for the Department on this.

Mr. MITTINO. I appreciate the opportunity. I might suggest that, we have been involved in some things that I think might be very helpful. For example, when we go into these title III projects, it turns out to be very interesting.

Years back, loan guarantees were one of the funding mechanisms that we used. If one looks at loan guarantees, one soon finds that there is something less than an adequate business incentive to make that project go well.

Having learned that, it now develops that all of our projects are based on purchase guarantees for a specific product. Therefore, all of the dollars we are spending on title III of the Defense Production Act would be let in contracts that require the delivery of a qualified product, so we get something for our money.

We also offer to the contractor some reasonable guarantee of selling *x* amount of product if he cannot otherwise market that product. This gives him a good business incentive, and permits us to exercise legitimate control over these expenditures.

Mr. BROWN. Well, you are using the market power, the purchasing power, of the Defense Department to achieve this kind of goal. We don't have quite the same controls over the civilian marketplace where the Government is not a customer.

On the other hand, we do have a very large civilian sector of Government which is a customer, itself. The thing that comes to mind is, of course, the role that the Government can play in areas such as the procurement of advanced computers, which is where large consumers are.

Do you see any possibility of utilizing similar strategy in the civilian area, using the power of the Government as a customer, similar to what the Defense Department does?

Mr. MITTINO. Well, that is kind of a tough question. As a matter of fact, it is interesting to note that the Defense Department takes, in most commodities, something under 6 percent of the total market, so we are losing the heavy leverage that we had at one time.

But I would suggest that the methodology we have developed might be useful. I am reminded that the space initiative, the SDI program, is setting up a special office to transfer appropriate technology into the public domain. We, in the Defense Department, are beginning to think alike in some of these important areas.

Mr. BROWN. Well, we appreciate what you are doing in that area. We hope that those ideas which you have tested and proven to be viable can be used more broadly.

Mr. Ritter.

Mr. RITTER. Thank you, Mr. Chairman.

I guess my question would be, how extensive within the Department of Defense are programs like yours, or, if not precisely the same as yours, but programs that have initiatives to develop broad-based technology relating to the very core of America's industrial competitiveness, competitive with some of the programs taking place now out in the universities to develop manufacturing science capability?

There is a fair amount of other things that the Department of Defense is doing.

Could you just summarize some of that for us?

Mr. MITTINO. I will be very happy to, and thank you for the question, Mr. Ritter. You give me a chance to explain some of this.

I often say that it's like a mathematical simile. We are no more than a customer of the private marketplace, as opposed to 35 years ago, when we drove much of that market and drove much of the technology. It is altogether different now. We are a customer.

We also have a national policy to divest ourselves of ownership of facilities and/or industrial equipment.

Now, what I am getting to is that, as a mathematical simile, as good as our commercial industry is at large, only that good will be our ability to take from industry as a customer, and equip the military forces. We have every interest, therefore, and every need to evolve into a healthy, revitalized, industrial, competitive base. And I am sure this is what you have been talking about in this committee.

Yes, we do have programs.

For example, we currently have put together what we call the defense manufacturing initiative. It is a series of initiatives that are designed to use the defense leverage in these areas as a customer and as a highly demanding customer in high technology areas to foster, encourage, and improve that base out there.

Now, what does that mean?

To give you an example of what is in the plan, for example, we have a nominally funded $150 million-a-year manufacturing technology program comprised of several dozen manufacturing technology, productivity improvement projects. We, of course, have title III as we were talking about this morning. We will be assembling in the fall time period the senior executives of major defense industries, and we do invite even the nondefense industries to develop with us the things that defense can do to make its contribution to the overall national problem for bringing manufacturing back to the United States, revitalizing industry, making this industry healthy and competitive, all hopefully without the disadvantages of artificial fixes, if you will—temporary fixes. We believe that in the last analysis, the industry must be competitive, must be price-competitive. We want to hold on to the technology we have now and get back what we are losing and go from there.

Mr. RITTER. Thank you.

Could you perhaps for the record provide a 2-page summary that just documents the individual programs, their goals, their relationship to the industrial economy, and their fund allocations?

Mr. MITTINO. I would be delighted to.

Mr. RITTER. Will you provide it to this committee, and to me personally? I think that would be very helpful.

Mr. BROWN. Mr. Ritter, I am very glad you made that request. You anticipated me slightly. You could even make that three pages, if you'd like.

Mr. MITTINO. Thank you very much.

Mr. BROWN. We are very much interested in manufacturing productivity improvement. If you could also include with that a 5-year budget layout—any 5 years—for the last 5 years, or the next 5 years, or whatever you feel most confident with—I just want to get a feel for the order of magnitude.

Mr. **Mittino**. Whatever we have, I will provide it. I am not sure how much has been developed.

Mr. **Brown**. If you can only get 3 years, that is all right, too.

Mr. **Mittino**. All right.

Mr. **Brown**. But this is a vitally important area, and one the committee is extremely interested in.

[Material to be supplied follows:]

STRATEGIES FOR EXPLOITING TECHNOLOGY

As noted earlier, The Department of Defense must take decisive actions to reverse the accelerating trend that results in greater percentages of critical defense material being manufactured offshore. This deindustrialization continues to erode the U.S. manufacturing base. A recent issue of Business Week talks about the "hollow corporation" and how companies are increasingly becoming marketing fronts for foreign produced products. This robs the U.S. of the technical ingenuity necessary for long-term economic survival and could translate ultimately into a "hollow defense" if allowed to continue. And with an annual procurement budget in excess of $120 billion, the DOD is uniquely situated to function as a catalyst in promoting the manufacturing and productivity improvement in both the defense and commercial sectors of the economy. In short, the DOD must find ways to marshal private sector resources and market place decisions that strengthen the industrial base.

Existing DOD funded efforts that directly relate to the above are described below. Strong and increased support of these efforts is essential in providing a foundation for expanded DOD success.

The Manufacturing Technology Program (MTP) is a broad based, production oriented program supporting the DOD Research, Development and Acquisition Program by providing new and innovative manufacturing technology (MT) which will result in more economical, timely and reliable production of DOD material. Projects are expected to result in a "factory floor" application of productivity enhancing technologies and are viewed as "seed money" investments necessary to reduce the technical and fiscal risks of follow-on implementation of the results in the defense production base. The MTP is funded from a single RDT&E Program Element in each of the three Military Departments and the Defense Logistics Agency. Most projects are executed by the private sector after competitive selection. Several hundred individual investments are active at any one time.

By achieving its objectives, the MTP:

Reduces production costs;

Shortens production lead time;

Improves product quality and reliability;

Improves production safety and reduces pollution especially in the ammunition production base;

Provides alternate production sources where high-cost, sole source production exists;

Lower repair costs;

Provides proven manufacturing techniques for new design options;

Conserves critical materials;

Avoids duplication of effort; and

Serves as a catalyst to solve Defense production base problems.

DOD MANUFACTURING TECHNOLOGY PROGRAM

[In millions of dollars]

Fiscal year	1984	1985	1986	1987 request
Army	$80	$80	$76	$23
Navy	57	50	52	31
Air Force	58	56	65	84
DLA			3	5
Total	195	189	198	149

Typical recent MTP success stories include:

Developed an improved crystal growth process for manufacturing purity Gallium Arsenide (GaAs). GaAs substrate devices are being used on the F-14, F-18 as well as the Sparrow, AMRAAM, and PHOENIX missiles. Annual savings to the Navy alone is $25 million. The MTP investment was $528,000.

Developed automated procedures for the previously labor intensive weaving of delicate carbon fiber yarns into complex 3D designs for shapestable, nosetips and strategic missile rocket nozzles used on the TRIDENT II. Savings to date are $450,000. Expected savings are $28 million. The MTP investment was $1.61 million.

Established a new test method for measuring glare performance of night vision devices. Time and skill level were reduced and yield increased. Pilot/crew and soldier safety are significantly enhanced. Savings to date are $587,000. Expected savings are $4.3 million per year. The MTP investment was $104,000.

The Industrial Modernization Incentive Program (IMIP) is a high priority DOD program promoting factory modernization, productivity improvement, and increased quality. IMIP is pursued where overall acquisition costs are reduced. Although the main focus in IMIP is on contractor investment, the Air Force position is that limited DOD direct funding is essential in certain circumstances. This funding is used as seed money to foster substantially increased contractor capital investment levels. Leverage is obtained and corresponding contractor capital investment opportunities are encouraged. These seed funds are particularly important when dealing with the subcontractor and vender segments of the inustrial base.

The Air Force included IMIP funding of apprximately $20M in their fiscal year 87 budget request as one element under Industrial Preparedness (PE 78011F) and contained in the 3010, 3020, and 3080 appropriation categories. This represents a decline from recent years, but the DOD plans to request increased levels of direct funding in the future to support IMIP efforts. Another important effort is our use of Defense Production Act—Title III Authorities.

The DOD is currently in the process of implementing use of Title III to meet the national defense, particularly in those extraordinary circumstances where we are unacceptably dependent on foreign sources of industrial supply or lack of domestic production capacity and we cannot rely on free market forces to respond in time to meet defense needs. In addition, DOD implementation of Title III is a decisive action pursued to establish or restore the technical ingenuity necessary to ensure the availability of long-term domestic industrial capabilities necessary for national defense. Title III helps stem or reverse part of the accelerating trend resulting in greater percentages of critical defense material being manufactured offshore. DOD use of Title III is not protectionism; it is an optional incentive by which we can marshall private sector resources and marketplace decisions that strengthen the defense industrial base and promote long-term survival of needed technologies. Therefore, use of Title III is a good business practice for DOD.

Appropriations available under DPA authorizations will be used for long-term purchase guarantee contracts for industrial materials. These contracts will establish or maintain a domestic industrial capacity for critical national defense products when normal market incentives are insufficient. We expect to be awarding the first two defense contracts using Title III appropriations shortly. DOD budget appropriation for Title III funding for purchase guarantees are: Fiscal Year 1985—$10 million and Fiscal Year 1986—$31 million. We are asking for $30 million for Fiscal Year 1987 and $97 million for Fiscal Year 1988.

Mr. RITTER. Mr. Chairman, if you will yield back, the last time I was in Japan, I was talking to some people from MITI, and I was commenting on the fact that there was absolutely nothing like MITI in the United States, and his comment was, oh, yes, there is. And I said what? That is a surprise to me. He said, well, it is the "industrial base"—he used that term—Industrial Base Program of the Department of Defense.

Is what you have described to us in summary, is that basically what he is talking about?

What was he precisely talking about?

Was he talking about the $150 million a year manufacturing technologies program?

Mr. MITTINO. We have what we call an industrial readiness, or industrial resources office, and that office dedicates itself to these kinds of things and preparedness planning for emergencies. The office monitors, for example, the national defense stockpile of critical materials.

Mr. **Ritter**. But he was alluding more specifically to a program that applied money directly into American industry to enhance manufacturing technology. Was this perhaps the $150 million a year program, or was it the sum total of the programs you have been talking about?

It is important for us on this committee to know what you are doing in defense so that we can have some perspective on what is already available, where it's going, what its focus is, and what we want to do in addition.

Mr. **Mittino**. I would suggest that he certainly was referring to the manufacturing technology program among other things. We also have what we call an Industrial Modernization Incentives Program [IMIP], which is a program designed to provide businesses with financial incentives to make productivity enhancing investments which also provide spinoffs for the commercial sector.

Now, what do we give them in return? We share the savings from these productivity enhancements with the contractor, so he now has his business incentive to make the improvement; we get the benefit with our savings on the end items we buy.

So, I am sure that the gentleman, or people you spoke with, are referring to those programs.

Mr. **Ritter**. And these will be summarized in the document to the committee?

Mr. **Mittino**. Right. I might say they are nominally funded. We don't, as the chairman said before, we don't have a lot of dollars in these programs because they are competing with end items like airplanes and ships and tanks.

Mr. **Ritter**. It is interesting that in the Defense Department something which is nominally funded to some other department, is bigger than the entire budget of the National Bureau of Standards. It is just an observation.

Mr. **Brown**. We will not draw any invidious comparisons in this committee. [Laughter.]

Does that conclude your questions, Mr. Ritter?

Mr. **Ritter**. Thank you, Mr. Chairman.

Mr. **Brown**. Gentlemen, we very much appreciate your testimony. We look forward to receiving the information you indicated, and it will be a valuable part of the record of this hearing.

Mr. **Mittino**. Thank you very much. It has been my pleasure, sir.

Mr. **Brown**. Thank you.

We will now hear from the panel, and will ask them all to come up to the table: Prof. George C. Lodge, from Harvard; Howard Samuel, from the Industrial Union Department, AFL-CIO; and Dr. Rosenstein, who has already been glowingly referred to, from the Department of Engineering at UCLA.

Now, if you gentlemen are agreeable, I would like to have your proceed in the order in which I have introduced you: Professor Lodge first, Mr. Samuel, and then Dr. Rosenstein.

Professor Lodge, we are very pleased to have you here. We are aware of your long record both in academia and in government and other activities, and we feel that obviously you can make a very valuable contribution to the hearing record here, and we look forward to your testimony. You may proceed.

STATEMENT OF PROF. GEORGE C. LODGE, HARVARD GRADUATE BUSINESS SCHOOL

Professor LODGE. Mr. Chairman, thank you very much. Thank you for the opportunity to meet with you today and to testify in support of H.R. 3997.

I believe that this bill represents an important element in a range of actions that need to be taken in order for the United States to regain its competitiveness in the world economy, a competitiveness which it has been losing for 15 years, and which it is losing today.

For example, if the foundation were in existence, both the Congress and the American people might have some inkling as to the impact of the tax bill now before the Congress on U.S. competitiveness.

As far as I know, we have no idea whatsoever what the impact will be. My own guess is, it will be negative, but that is only a guess.

If the foundation were in existence, we would also know something about how our lack of competitiveness is affecting our national security. There must be a threshold below which it is a security problem for an industry to sink, whether it is fiber optics, or telecommunications, or semiconductors, or whatever.

I don't believe the Defense Department has defined what that threshold is. In fact, I wouldn't be surprised if the Defense Department and its contractors are significantly dependent upon imports for critical weapon systems right today. Indeed, the reasonably modest steps that were described by the previous speaker may well result, when the chips are down, in increasing imports.

The problem of competitiveness has many aspects, the most important of which is, as of this point that nobody has taken it seriously, especially with the exception of a few like yourself. It has not been taken seriously in this city, in my judgment; it has not been taken seriously by the economics profession. Often when it is considered by companies, the companies quite understandably have to put the competitiveness of the company as being the primary consideration, and not the competitiveness of the country.

The problem, of course, is not the competitiveness of American companies. The problem is the competitiveness of the country. Many companies are retaining or regaining competitiveness by leaving. That is fine for the company, but it does not help the country, except insofar as the shareholders may benefit.

You know the measures of uncompetitiveness; I am sure you have had it in this series of testimony. The share of gross national product down about half in the last 30 years; the share of world exports down about half; a trade deficit of $150 billion as trade becomes more and more important in the gross national product of the United States. Indeed, the importance of trade in the gross national product of the United States now approaches that of Japan.

The real incomes of working people have deteriorated over the last 10 years or more and corporate profits have shown a dismal record.

There is no quick fix. There is no single solution. For a long time, as you know, people were saying, let the value of the dollar go down, and then everything will be all right. That is not so. In fact, the declining value of the dollar is likely to have an insignificant impact on our competitiveness difficulties. The causes of our competitiveness problem are systemic: low savings, low investment, low productivity, high costs, poor quality, the exchange rate, high interest rates, education, bad management—often shortsighted adversarial labor/management relations, antique conceptions of antitrust, subsidies, and huge Government allocations of credit to those sectors of the economy which are thoroughly insulated from foreign competition, such as housing and real estate.

We have a strategy which is consumption-oriented, short-term, buy-now-pay-later, up against a strategy which is investment oriented, long-run and competitive, aimed at acquiring markets here, aimed at increasing the standard of living by acquiring market shares. And, as you know, we are now sustaining our standard of living and our defense commitment on borrowed money.

You can do it for awhile, but not for very long.

In my statement, I went through what seemed to me to be the basic premises of the old system which need to be inspected and renovated and replaced if we are to have success.

I won't do that at this time, because I don't want to talk too long. But I will be glad to talk about that in the question period.

[The prepared statement of Mr. Lodge follows:]

Statement of George C. Lodge on
United States Competitiveness in the World Economy
to the House Subcommittee on Science, Research and Technology

June 26, 1986

It is clear to anyone who will look that the competitiveness of the United States in the world economy is eroding; it has been happening for at least 15 years; it is getting worse. The evidence is in a raft of studies conducted by my colleagues and me at Harvard; Stephen Cohen, David Teece, John Zysman and others at Berkeley; Lester Thurow at MIT; John Young and his presidential Commission on Competitiveness; the National Academy of Sciences; the Office of Competitive Assessment in the U.S. Department of Commerce, and many others.[1]

The erosion is occurring not only in mature industries, such as steel and automobiles, but also in those of the future upon which our nation's standard of living over the long run depends: machine tools, robots, fiber optics, telecommunications, semiconductors, civilian aviation, electronics, pharmaceuticals, and even in service industries such as banking and finance. Let me be clear: I am not referring to the competitiveness of American companies which in many instances are retaining their health by going abroad but to the competitiveness of the nation.

Wishful thinkers have felt that a decline in the value of the dollar would rescue us from decline, but they are wrong. It will help by making exports less expensive and imports more so, but the impact will not be significant. Our challengers, like Japan, have national strategies that can adjust and adapt to exchange rate fluctuations. Their goals are different. Japan is focused on gaining long-run market share of the nation's products and services in the world, not on short-run profits for individual companies. (Ironically, however, Japan's strategy over the long run seems to result in hefty profits as well as market share.[2]) And other countries have learned or will learn from Japan's example: South Korea, Taiwan, Singapore, Malaysia and perhaps Brazil and India. Given their conception of the global economic game, it is irrelevant to say they are not playing by "the rules," our rules. They believe, with reason, that they have found a better--at least a more competitive--way. There is no recourse in protection of our uncompetitive ways nor in retaliation against the winners. The only remedy is for the United States as a total community--government, business, labor, education--to become more competitive, and that means a new strategy. This, as I understand it, is the intention of the bill before us today.

Measures of Failure

Here are some measures of our national competitive deterioration:[3]

- The U.S. share of world gross national product is about half what it was 30 years ago. Perhaps this is as it should be given our extraordinary strength after World War II, but the question comes: How far down is far enough, given our goals of world leadership and our desire to improve our standard of living?
- The U.S. share of world markets measured in value is also down by about a half from about 20% in 1950 to about 10%

today. The drop has been particularly dramatic in high technology industries. For example, the U.S. share of world markets in electronics is down to less than 10% of what it was in 1965; wide body jets are down by 35% or more. By 1984 Japan had won 70% of the 64 K RAM chip market and 92% of the market for the new 256 K RAMS. In machine tools, upon which so much of the future of manufacturing depends, U.S. manufacturers have lost 50% of their markets in the last five years. It is estimated that 29% of the parts of domestically produced automobiles will be imported by 1995, up from 18% in 1985. And in services, Japan now has a greater world market share in financial services than the U.S. Other high value services follow manufacturing, leaving behind relatively low cost, low wage activities. And these are leaving American shores with market research firms and other keypunch and typing operations going to Barbados and elsewhere. Small wonder that Akio Morita, chairman of Sony, warned: "The U.S. is abandoning its status as an industrial power."

- At the same time that we have been losing in the trade battle, the importance of trade in our GNP has been increasing. Exports now account for 13% of the GNP, close to Japan's 17%.
- Another measure of competitive deterioration is the trade deficit, currently hovering around $150 billion a year. Some $50 billion of that is with Japan, about half of

which is in the highest technology areas. It appears, for example, that we are increasingly dependent on Japan even for the high tech components of our weapons systems and the Strategic Defense Initiative (Star Wars).

- o At the same time over the last 10 years or so the real incomes of working people--not those on indexed pensions or social security, but those who work--has been declining. And the profitability of American manufacturing has been declining.

What it Takes to Win

A review of several Commerce Department assessments of industrial competitiveness indicate some prerequisites for competititve success:[4]

1) Company size. The winners are big and strong, and when it comes to advanced computer-controlled machinery and robots, they have considerable ability to integrate the systems they produce. Furthermore, they are able to weather cyclical downturns in the economy without losing markets. They depend upon developing economies of scale both to lower costs and generate the revenues for investment in further innovation.

2) Relations with government. The winners invariably enjoy special and close relations with their governments. For example, the following description of the role of the Japanese government with respect to the machine tool industry is repeated almost verbatim in studies of other industries which are on the frontier of technology:

"The Ministry of International Trade and Industry (MITI) exerts a strong influence over the direction of Japanese industrial development through low-interest loans, the approval of licensing agreements for the sale or acquisition of new technology, and through the control of trade flows. MITI's philosophy is to encourage growth in those industries that have a high value-added content and a high projected external demand among industrialized partners. ... MITI has encouraged heavy investment in machine tools and the willingness of Japanese banks to finance machine tool firms at debt-to-equity ratios three to ten times the accepted rate in the U.S. has enhanced the ability of such firms to undertake long-term capital expansions and investments."[5]

Further, the Japanese government has enacted legislation "to provide the legal basis for government planned rationalization and promotion of industry associations, the provision of antitrust immunity for interfirm activities undertaken to achieve the government's planned objectives, temporary bans on imports of certain foreign machinery to stimulate domestic production, government-sponsored R and D, low-interest loans, tax incentives, favorable depreciation schedules, etc."[6] Tax advantages given to the machine tool industry between 1950 and 1981 resulted in revenue losses of about $40 billion.

The result of these policies was that the average cost of capital to the machine tool industry in Japan "was nearing 8% as compared to 16% in the United States."[7]

To encourage the use of robots by small and medium-sized firms and to build a large domestic market to allow scale economies for Japanese robot manufacturers, the government encouraged the establishment of the Japan Robot Leasing Company, Ltd. (JAROL) in 1980. It was a joint venture between 24 robot manufacturers and 10 insurance companies. The Japan Development Bank provided JAROL with low-interest loans to allow for easy leasing terms.[8] By 1982, Japan had 31,900 industrial robots in place; the U.S., 7,232 (p. 7). Interest group pluralism cannot be relied upon to secure this kind of favorable treatment in the United States since, as the Commerce study notes, only 2,251 people were employed making robots in the U.S. in 1983, 969 production workers and 1,282 professional workers.[9]

Although not as sophisticated or extensive as Japan's, Germany's national strategy has many of the same features of government-business collaboration for competitive success[10] (pp. 45-47 and 59-61).

3) Low costs. The winners have lower costs of both labor and capital than the United States. Labor costs are kept lower by higher rates of productivity growth deriving from higher rates of investment encouraged by government policies described above; by careful management; and by generally somewhat lower wages, especially for professional and managerial employees.[11] Capital costs are more competitive because of the greater dependence on debt and the effects of government policies on the cost of debt.

4) Market access. Asian and European producers have enjoyed virtually free access to the high tech markets of the United States. U.S. trade policy has never aimed at promoting competitiveness but rather at preserving the lack of it in such industries as steel, autos, footwear or whatever. So competitors have entered U.S. markets with high quality, low cost products, capturing ever-increasing share of that market. Meanwhile a variety of policies and practices have tended to make it difficult for U.S. producers to enter the markets of our competitors. The U.S. government has made efforts to change these policies and practices but with no great success.

5) Skills and commitment. The education and training policies of our competitors are producing more and better equipped engineers and technicians than those of the United States. Indeed, the Commerce studies

found absolute shortages of professional, managerial and production personnel who knew how to make or use the latest computerized manufacturing equipment. Japan produces twice as many engineers per capita as the United States, although we have 600,000 lawyers compared to their 13,000.

Perhaps the most remarkable feature of America's competitive decline has been the refusal or reluctance of our country's leaders to perceive or admit it. As Ruben F. Mettler, chairman of TRW and former head of the Business Roundtable, said: "....too many Americans and unfortunately many in leadership positions, don't fully accept the need to be fully competitive on a worldwide basis. Our easy economic superiority of prior decades has created a dangerous national sense of economic isolation and invulnerability."[11a] Even today, for example, the 1986 Report of the President's Economic Advisers seems to say that all is well, that the only problem is there are cheaters in the world who must be forced to behave. The report boasts, for example, of the administration's actions to force the Japanese to buy U.S. leather and tobacco products as though that was even remotely connected to the general problem (see Chapter 3, p. 124). The fact is that the causes of our deterioration are deeply rooted in our system and our traditions. And indeed they are in many ways related to the economic theories upon which we have long relied. Consequently a fair amount of crisis will be required for us to change our ways. The question is: How do we make maximum use of minimum crisis for maximum change? Unfortunately today the crisis is being blunted by our ability to borrow from abroad what we cannot earn. This ability, however, is fragile. We will face a day of reckoning. To prepare for it, let me briefly list the causes of our deterioration and set out generally what must be done.

Causes of Failure

The causes are many and varied: low rates of savings and investment; low productivity--it actually declined at an annual rate of 2.5% in the first part of 1985; high costs of labor, the result often of adversarial labor relations; high interest rates due in part to a consumption-oriented, buy-now pay-later economic strategy; high-capital costs; managers whose vision is limited to quarterly dividends to shareholders rather than long-term market share; neglect of manufacturing innovation and efficiency; complacency; poor education; too many lawyers; not enough engineers; and more.

Although, we are doing better than most of our European trading partners, we and they are being beaten by five Asian nations--Japan, South Korea, Taiwan, Singapore and Hong Kong--who in 1984 exported more to the United States than the rest of the world combined. And more nations will undoubtedly be following their good example. Our problem can be traced to no single cause or even groups of causes. Our problem is systemic. As my colleague Professor Bruce Scott has pointed out, we are being beaten by nations which have a more competitive national strategy, one that is aimed at earning a rising standard of living by gaining and retaining competitiveness in the most profitable and fastest growing global industries through investment in those industries, looking for long-run market share, not short-run profits, with government acting as a coach if not a quarterback, building and maintaining a consensus among various social groups that ascribes a high priority to competitiveness.[12] The winning strategies channel the nation's resources into the training, education, research, innovation and organization required to acquire market share. They are also characterized by employee relations and human resource management policies which insure high productivity, high quality and competitive costs.

Remedies: Elements of A New Way[13]

For the United States to regain its strength and avoid the certain deterioration of our standard of living and defense capability a shift in fundamental assumptions or premises is required. Let me summarize four elements of that shift here. The first has to do with our conception of the place of the United States in the world economy, the second with the role of government, the third with the governance of the corporation and the relations between managers and those whom they manage, and the fourth with the rights and duties of membership in American society.

I. The old premise held that the place of nations in the world economy was properly determined by free trade among their individual firms operating in an open marketplace. If all obeyed the rules, all would benefit. The relative position of each nation was determined by its "comparative advantage," that with which nature had endowed it. Portugal, the textbook example went, should properly grow wine because God had blessed it with sunshine; England should grow sheep and make textiles--the high tech, high growth industry of the day. David Ricardo, the author of this "truth," was, of course, an Englishman not a Portuguese, and the Asian Five have shown that it is, in fact, not true at all. You can live on a rock in the fog and gain a competitive advantage over your neighbors if you have the will and the appropriate theories. They have created their comparative advantage and they have done it adopting quite different rules from those associated with terms like free trade, free markets and free enterprise. They have shown that if Portugal wants to attain England's standard of living, it should do whatever is necessary to compete successfully in textiles. What is most irritating to the high priests of the old order is that the Asian rules seem to work better.

The old notion was that the community need or national interest would be not only defined but fulfilled by competition to satisfy consumer desires, government acting essentially as a referee to keep markets open through the strict enforcement of the antitrust laws, administering a dose of regulation now and then to keep the rats out of the hot dogs, so to speak. The new premise is that community needs require explicit definition by the community, acting through government. Once defined there are a variety of devices for meeting them: the marketplace is surely one procedure which the Asians use admirably (and the Soviets at great cost do not), but there are also others including partnership with government, and cooperation and consolidation among firms to achieve such predetermined community needs as international competitiveness, clean air and water, or a landing on the moon.

The artful community is good at defining its needs and priorities and selecting the right mix of procedures for achieving it. The effective use of the new paradigm requires the rejection of the old while at the same time salvaging those traditional strengths that fit the contemporary reality. The first prerequisite is the recognition of that new reality: in my example, the fact of U.S. competitive failure. The denial of reality whether by nations or individuals, in science or economics, is a devastating disease.[14]

II. The second element of the old paradigm concerns the role of government. It contains two subelements which in the United States have come into conflict with one another. The first holds that government is a necessary evil; the less of it the better. Its authority should be checked, balanced, and separated among its three branches: the executive, the legislative and the judiciary. As much power as possible should be dispersed, and whatever else it may do, government should not "plan," that is, think coherently about the community's needs. Alongside this notion, there has existed a second and quite different premise. Government should intervene when crisis or a collection of interest groups demand it. In 1984, for example, the Congressional Budget Office estimated that government allocated directly to business a total of $131.9 billion, not including $140 billion to be spent by the Department of Defense for goods and services, and $110 billion paid to individuals through medical and housing subsidies.[15] Billions more were made available to consumers by allowing them to deduct from their taxes the interest on loans to purchase whatever they desired--a beach house, a yacht, a fur coat, or a Toyota.

The inexorability of government intervention following the demands of crisis and interest groups is clear. Our refusal to allow government to plan, means that such intervention is steadfastly oblivious of the national interest, amounting to visionless flailing. For many decades following World War II our relative power in the world was so great that we could afford such aimlessness; today the new reality makes the old paradigm a recipe for unaffordable waste and deterioration.

The costly ambivalence among the old premises demonstrates the need for a new one: the federal government must organize itself and join with private institutions to give competitiveness a high priority. Rather than subsidizing and protecting economic sectors which are already well insulated from competition, such as housing and real estate, an effective economic strategy for the future must encourage investment and efficiency in the frontier industries of the future. This means also a commitment to education and training for competitiveness, programs for those who are displaced, data collection and analysis to provide early warning of coming problems, and the general integration of all government policies so that together they support--instead of corrode--our competitiveness. It is said that Washington cannot pick "winners" and "losers." The trouble is that it does, generally, preferring the latter over the former. And one does not have to be particularly insightful to realize that microelectronics, telecommunications and biotechnology are going to be economically significant in the future and are somehow distinguishable from office buildings and shopping centers of which today there is a glut due to government policies.

III. The third element of the old assumptions concerns the nature of the corporation, the authority of managers and the relationships between those who manage and those who are managed. The old premise held that the purpose of the corporation is to make whatever products, provide whatever services, adopt whatever methods, practice whatever behavior, and locate in whatever community will most enrich the corporation's owners or shareholders--provided only that its officers obey the laws and regulations of the various jurisdictions in which it is operating. The authority of management--that is, its prerogatives--derives from the right of property. The right to manage comes via a board of directors from the shareholders, and management's primary obligation is to satisfy their desires.

This premise has been eroded by reality as shareholders of publicly owned firms became more numerous, dispersed, anonymous, and distant from the communities in which the firm operated. Thus, while in theory the purpose of the firm was to serve the interests of an involved constituency of shareholders who were presumably interested in the welfare of their community, in fact that constituency became increasingly remote and its commitment increasingly transitory. In these circumstances the divergence between the short-run interests of Wall Street and the longer term interest of employees, suppliers, and communities was inevitable. Furthermore, the increasing mobility of capital and technology contributed to worldwide sourcing of many products, increasing the vulnerability of those with a long-run interest in the corporation, that is, employees, suppliers, and affected communities. At the same time, the latter groups were by virtue of the traditional premise without representation in the governance of the corporation. Indeed, those with a long-run interest found themselves with no formal mechanism for even expressing their concerns.

In addition, the selection of management, although theoretically still the responsibility of shareholders, had in fact generally become a function of management itself. Managers were, in short, a self-perpetuating oligarchy, increasingly important to the lives and fortunes of employees, suppliers, and communities, expected to serve a variety of ill-defined and often contradictory purposes and subjected to stockholder control only in time of crisis. The old premise of corporate purpose and governance has eroded.

Although the new premise is obscure, its outlines are clear: The corporation's purpose is to serve all of its constituents, customers, suppliers, employees, shareholders, debt holders, and communities in a balanced way. Plainly the time has come when management is expected to give due regard to the "investments" of employees and communities that are affected by its behavior, as well as to those of equity and debt holders. If managers expect to receive the full commitment of employees to productivity, for example, those employees must be assured a measure of employment security in return. Indeed, to reach full potential, employees will expect and need participation in a wide variety of decisions that affect their work lives—in other words, a place in the governance process. Employees, in turn, most accept the responsibility to be competitive.

Implicit in the new premise is the notion that security of employment, carrying with it a reciprocal commitment to hard work, is a more competitive way in which to provide people with economic security than income security, where there is no such reciprocal commitment to work. Our Asian competitors have shown this. Until recently, however, we in the United States have assumed that managers had little responsibility for employment security, that they were empowered to hire and fire workers as market conditions and the satisfaction of shareholders might require, and that it was the responsibility of government to assure economic security. While a number of companies have granted employment security to their "permanent" employees, this is an informal, largely unrecognized development, which has left formal responsibility for economic security almost wholly with the government.

As in the other older industrial democracies of the West, the U.S. government has met its responsibility by providing income security, typically requiring no work in return. Such an approach maintains consumption but does little for production; and it imposes the "overhead cost" of economic security on society as a whole. It follows, therefore, that both productivity and the national economy will be better served if business takes greater responsibility for employment security, and government correspondingly less.

Regarding the role of a trade union, the old premise held that the union's fundamental mission is to bargain with management to acquire a larger share of corporate revenues for its members and to preserve and promote their safety, health and general welfare, with little consideration for the competitiveness of the firm.

The new premise holds that the old mission is augmented by an overriding concern for the health of the firm, which must be competitive or there will be no welfare, no wages, no jobs, and no members. The union's task is thus as much to help design and govern a corporate consensus as to bargain an adversarial contract. The form of union participation in governance varies widely and can extend from the shop floor to the board of directors. Since all workers must be committed to the corporate consensus, some form of effective two-way communication with employees is essential to allow appropriate employee participation in the consensual process and appropriate sharing of gains derived from competitiveness among all of the corporate constituencies.

IV. The fourth and final element in the shift we are considering involves rights and duties of membership in American society. The traditional notion was that the community is little more than the sum of the individuals in it. Self-fulfillment derives from an essentially lonely struggle in which the fit thrive and the rest either die or become the useful objects of charity. This idea has been substantially softened over the years, especially since the 1930s, by public demand that the nation provide its members with certain rights or entitlements: rights to income, education, health, employment, and more. These rights include a "safety net" to save the "truly needy" from disaster. The old premise of individualism, however, restrained public opinion from imposing many duties of membership, preferring to leave these to each citizen's upbringing, religion, and conscience.

The new premise is that just as the community assures rights to its members, so it must require duties. A community's performance will deteriorate if the former overload the latter. The assignment of duties by the community must be fair: if the poor and the weak are expected to work hard and well, so must the rich and the strong. If the assembly line worker is to relate wages to productivity, so must the CEO. The burdens of austerity must be equitably shared. If welfare for the poor has been cut, so must subsidies to the affluent. If America needs a well-trained elite to innovate and produce for the future, it must have an educational system that permits access to all. Most fundamentally, each generation has a duty to pay for what it consumes and not to saddle its children with the debt for what it enjoys.

Conclusion

It is obvious that these premises which need inspection and renovation go well beyond economics; they are part of the ideological fabric of the United States, rooted in traditional conceptions of individualism, property rights, marketplace competition, the limited state and interest group pluralism. They are in many ways what came to us through the founding fathers from the thought of John Locke and the other revolutionary thinkers who protested the suffocating effects of medieval communitarianism.

This traditional ideology obscures the reality of our deterioration. For many, the remedy is worse than the disease. But those who are so concerned should not forget that also rooted in our heritage is the thought of Alexander Hamilton, who wrote, "Capital is wayward and timid in lending itself to new undertakings, and the State ought to excite the confidence of capitalists, who are ever cautious and sagacious, by aiding them to overcome the obstacles that lie in the way of all experiments." They should also recall Abraham Lincoln who signed the Morrill Act establishing our public land-grant colleges "to provide instruction in the science of agriculture and the industrial arts."[16]

The denial of reality is a disease which afflicts this country because of the power of a certain traditional ideological paradigm. Just as when an individual suffers this well-known psychological disorder so with a nation: the cure is the same. It is to reach back in our experience, traditions and heritage, to find those elements which are compatible with reality, to strengthen them, to bind them together and to build on them.

The transition described here is not a choice but a necessity. It is bound to occur: the only question is when and how, with what pain and waste. It is being forced by world competition and our dependence on that world.

A comparison of the new premises with the old reminds us of the dangers of the transition against which we must guard. There is the danger of economic nationalism, which to avoid requires the creation of new international mechanisms through which the conflicting interests among nations and their global corporate partners may be harmonized. These mechanisms must embrace not only the rivalry among the industrial countries, like the United States and Japan, but also the relationships between the poor and indebted world with their wealthy creditors.

There is the danger of excessive and stifling government, of corporate-statism and even fascism as nations organize themselves to acquire a larger share of the economic pie. So it behooves us to proceed warily, ensuring that the processes of government are kept open and free. (Here a strong labor movement has special importance.) There is the danger that the individual will suffer in the push toward cooperation and consensualism in the workplace. The contract after all was invented to protect the individual from the groupiness of the Middle Ages. Now as we return to groupiness for competitive performance we must watch out for the individual who may not "fit," the eccentric, the maverick, the oppressed and abused. Finally, there is the danger that in accentuating duties the weak will suffer more than the strong. As we head towards austerity, the pain must be fairly shared as is the gain.

Endnotes

1. See for example: Bruce R. Scott and George C. Lodge, eds., *U.S. Competitiveness in the World Economy*, Harvard Business School Press, Boston, Mass., 1984; John Zysman and Stephen S. Cohen, *The Mercantilist Challenge to the Liberal International Trade Order*, a study prepared for the use of the Joint Economic Committee, U.S. Senate, 97th Congress, December 1982; Zysman and Laura Tyson, *American Industry in International Competition*, Cornell University Press, Ithaca, N.Y., 1983, pp. 422-227; Robert Reich, "Beyond Free Trade," *Foreign Affairs* (Spring 1982); Lester C. Thurow, *The Zero-Sum Solution*: *Building a World-Class American Economy*, Chapter 2, Simon and Schuster, N.Y, 1985; National Academy of Sciences Report on U.S. Competitiveness, 1985; *A Competitive Assessment of the U.S. Manufacturing Automation Equipment Industries*, International Trade Administration, U.S. Department of Commerce, Washington, D.C., June 1984.

2. See James C. Abegglen and George Stalk, Jr.; *Kaisha*: *The Japanese Corporation*; Basic Books; New York, N.Y., 1985.

3. These measures are drawn from the sources listed above as well as: *Business Week*, March 3, 1986; pp 57-81, and *Business Week*, June 16, 1986, p. 100.

4. See *Assessment of U.S. Manufacturing Automation Equipment Industries*, op. cit.

5. ibid, p. 38.

6. ibid, p. 39.

7. ibid, p. 42.

8. ibid, p. 57.

9. ibid, p. 29.

10. ibid., pp. 45-47 and 59-61.

11. ibid, p. 71.

11a Speech, Hot Springs, Va., April 19, 1986, p. 2.

12. See Scott, Chapters 2 and 3, in Scott and Lodge, eds., op. cit.

13. Portions of this section of the statement are drawn from Scott and Lodge, U.S. Competitiveness in the World Economy: A Problem of Premises, Harvard Business School Working Paper, 1984, (9-785-013).

14. See George C. Lodge, The American Disease, Alfred Knopf, New York 1984.

15. "Federal Support of U.S. Business" (Washington, D.C.: U.S. Government Printing Office, January 1984), pp. ix-xiv and 40. Chalmers Johnson notes the U.S. "government expenditures in 1981 as a percent of gross domestic product were 18.1 (Japan 10.1), public sector employment as a percent of labor force 16.5 (Japan 6.6), ... and income taxes and social security payments as a percent of gross income 30.1 (Japan 22.3)." (See "The Industrial Policy Debate Re-examined," California Management Review, Vol. XXVII, No. 1, Fall 1984, p. 77.)

16. Quoted in Johnson (see endnote 15).

Mr. BROWN. We will put your statement in the record, Professor Lodge. We appreciate it very much.

Mr. Samuel.

STATEMENT OF HOWARD SAMUEL, PRESIDENT, INDUSTRIAL UNION DEPARTMENT, AFL-CIO

Mr. SAMUEL. Thank you, Mr. Chairman. With the chairman's permission, I will summarize and abbreviate the full testimony.

Mr. BROWN. That will be fine. And the full statement will appear likewise.

Mr. SAMUEL. I am pleased to have this opportunity to testify in support of H.R. 3997, the National Policy and Technology Foundation Act. The legislation you are considering faces up to the stark facts which our Nation must recognize and confront.

First, our economy is no longer insulated from the economic activities of the rest of the world;

Second, neither our concepts nor our perceptions, nor our public and private institutions, have kept pace with the new global imperatives; and

Third, as a result, we have been steadily losing our ability to compete in the world of international trade as it exists today.

The subject is one which is all too familiar to America's working men and women. As you well know, we are on the front line of economic struggle with our trading partners, and we are the ones who have been the first and most serious victims of the steady series of losses we have suffered in this struggle for the past two decades.

The cost can be counted in human terms and broken families, despair, illness, and alcoholism, suicide and dying communities. And it can be counted in economic terms in lost production and tax revenues, trade and budget deficits, diminishing productivity, and a declining standard of living.

As the impact of international trade began to be felt in a growing spectrum of industries, we in the labor movement several years ago began to review our conceptual approaches and look for new institutional arrangements to enable a free market economy such as ours to meet the challenge posed by other countries which had no reluctance about government intervention on a massive and systematic scale.

We knew that our democratic society could not import intact the institutions or practices of other nations with different traditions. We also knew that we had to develop new approaches of our own. Business as usual was not enough.

The result of our deliberations is a comprehensive program approved by first the Industrial Union Department and later by the AFL-CIO as a whole, which seeks to bring together all the elements affecting our competitiveness into one strategic approach.

The key to our program is a framework which would permit and encourage the private sector, management, labor, the community, to establish a dialogue among themselves and with Government to share information and experience, to analyze our problems, and to develop, if possible, an agreed-upon set of remedies.

Such a framework should be created not only for the industrial sector as a whole, but also for individual industries, each of which has experienced a different set of problems.

Would this open the door to an impermissible degree of Government interference with business? Some of our critics in academia, even in business, have seemed to think so. I must confess that I have been astonished at the complaints.

Government in America at the Federal, State, and local level already intervenes into business and the economy on a massive basis. It would take a very large volume to list just the impact of Federal involvement on the economy as a whole, as well as in specific sectors and industries in terms of regulation, tax and trade policy, subsidy special rules and laws. It is nothing new.

Theories underlying these interventions date back to Alexander Hamilton, our first Secretary of the Treasury, and such early notable congressional leaders as Henry Clay and John Calhoun.

Unfortunately, because we are still wedded to the free market ideal in theory, if not in practice, many Americans have tended to deny the extent of Government intervention, to pretend it does not exist. As a result, many of our Government programs and policies are illogical, contradictory, and even counterproductive.

The goal of the bill you are considering, therefore, would not be necessarily to introduce an expanded dimension in the Government's role, but to make it systematic, logical, and effective.

Now, the question, I guess, would occur: is this simply a self-serving statement by American labor interested only in preserving our current jobs and conditions in the face of a changing economic climate?

And here I would like to summarize just briefly the fact that there have been a number of institutions in recent years which I think have indicated by their reports and programs a similar kind of feeling.

Now, one of the earliest was a document which was published by the Labor Industry Coalition for International Trade, known as LICIT, which represents about a dozen and a half major corporations, such as AT&T, Corning Glass, Westinghouse, W.R. Grace, Allied Signal, and so forth, and a group of industrial unions.

The LICIT report in 1983 was quite optimistic in its references to past experiences and pointed out that as far as they are concerned, more broadly cooperative efforts by industry and labor have convinced those of us involved that an often surprisingly broad range of consensus exists, or can be developed, among labor, management, and Government affecting the future of American industry.

That is a quotation from the LICIT report of 1983.

In 1984, the Center for National Policy created a broadly representative study group which published a statement on restoring American competitiveness. The group members included such business leaders as Felix Rohatyn, senior partner, Lazard Freres; Irving Shapiro, the former chairman of DuPont; W. Michael Blumenthal, the former Secretary of the Treasury, and chairman of the Burroughs Corp.; Ben W. Heineman, Sr., president of Northwest Industries; Lee Iacocca, of Chrysler; and Robert McNamara, former president of the World Bank.

My testimony includes a quotation from this report which clearly supports the need of a dialogue between labor, business, and the Government in order to develop strategies and concepts to meet our competitiveness problem.

And, finally, you are all aware of the President's Commission on Industrial Competitiveness. As you know, the Commission was chaired by John Young, chairman and chief executive officer of Hewlett-Packard, and included among its 30 members were 20 other distinguished leaders of business and financial organizations.

I was one of two representatives of organized labor, and the Commission's report there also indicated in its final recommendations the need for finding consensus on a national level.

Let me close, Mr. Chairman, by referring to a specific example of the consensus and cooperation that your bill could well promote.

Several years ago, the leaders of my union, the Amalgamated Clothing and Textile Workers Union, persuaded a number of industry leaders in the men's apparel industry that unless technological improvements were to be encouraged and implemented rapidly, foreign competitors boasting extremely low labor costs would capture the U.S. market.

Labor and management together then approached Government and eventually persuaded the Department of Commerce to help share in the cost of developing new technology through the Tailored Clothing Technology Corp. All told, the three sectors—labor, management and Government—have raised a total of $8 million for the effort, but it has taken 5 years to do it.

Meanwhile, the Japanese Government was undertaking its own consensus-building operation, and in no time at all had committed $60 million to the same goal.

I do not suggest that this bill, or any legislation, can, or should, try to create a mirror image of Japanese competitiveness strategies in the United States. But the time is growing short for us to at least develop our own strategies to achieve the same capability. And this bill, I believe, is a worthy first step.

Thank you.

[The prepared statement of Mr. Samuel follows:]

Statement of the Industrial Union Department, AFL-CIO

By Howard D. Samuel

On The National Policy and Technology Foundation Act (H.R. 3997)

Before the Subcommittee on Science, Research and Technology

Of the Committee on Science and Technology

U.S. House of Representatives

June 26, 1986

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Elmer Chatak, *Secretary-Treasurer*

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About IUD

The Industrial Union Department is the largest of the AFL-CIO's constitutional departments, with 57 affiliated unions representing 5½ million members.

As a constitutional department, IUD is a semi-autonomous branch of the AFL-CIO. The department is financed directly by per capita payments from its affiliates. It is directed by a president and a secretary-treasurer who are elected at biennial conventions. The governing body is an executive council composed of the two officers and 24 members, who are principal officers of affiliated unions.

History

The IUD stems from the 1955 merger agreement between the AFL and the CIO, which provided for a new industrial union department within the merged federation. Walter Reuther, then CIO and UAW president, was elected its first president.

Reuther was succeeded in 1968 by I.W. Abel, president of the United Steelworkers of America, who served until 1977. Jacob Clayman succeeded Abel for one term, until 1979, when Howard D. Samuel was elected president and Elmer Chatak, secretary-treasurer. Clayman had served as IUD secretary-treasurer from 1975 to 1977. James Carey, former IUE president and CIO secretarial treasurer, was the department's first secretary-treasurer, in office from 1955 to 1965.

Function

From its inception, the function of IUD has been to provide support services to affiliated unions in those areas where they share common concerns and where special efforts are needed to supplement the work of individual unions and the AFL-CIO.

IUD has a tradition of working with coalitions to strengthen labor's position on key issues. The department helped create the OSHA/Environmental Network, the Full Employment Action Council, the Consumer Federation of America, and a number of others.

Programs

Organizing – More than one-third of IUD's resources are devoted to organizing. The department initiated the concept of cooperative organizing under then President Reuther in 1963, and has provided major support for many organizing campaigns since then. Under this approach, unions assign their organizers to work under the direction of an IUD coordinator. The method encourages cooperation among affiliates through the pooling of available resources and virtually eliminates jurisdictional disputes. The organizing section is located in Atlanta, Ga., with field offices in the Mid-South and Southeast.

Coordinated Bargaining – Another hallmark of IUD is coordinated bargaining, which brings together different unions having contracts with the same company to give them stronger leverage at the bargaining table. More than 40 unions participate in 71 different company committees, involving about 2,200 bargaining units and three-quarters of a million workers.

Safety, Health & Environment – Ever since it played a leading role in passage of the 1970 Occupational Safety and Health Act, IUD has taken the initiative in the courts and in legislative battles to assure proper implementation of the law. Through its work with the OSHA/Environmental Network, the department also has helped defend environmental protections.

Economic Policy – IUD has responded to downturns in the economy by examining and calling attention to the long-term problems faced by America's industrial sector. The department is a prime mover in efforts to develop a national industrial policy for the U.S. that will revitalize the industrial sector.

International Trade – This area has been an important concern to IUD because of the enormous impact that the policies of foreign governments have on U.S. industries and industrial union members. IUD continues to develop analyses, educational efforts and legislative approaches to key areas of trade policy, often through coalition activities.

Pensions – IUD monitors regulatory and legislative activities that could affect the status of benefit plans negotiated by its affiliates. The investment policies of private pension plans are an area of special concern for the department, which publishes *Labor & Investments*, the principal publication in this field.

Howard D. Samuel
President

Howard D. Samuel's career in the labor movement has spanned more than 30 years, and culminated in his election as president of the IUD in September 1979. For most of the period 1949-77, he was associated with the Amalgamated Clothing Workers of America, first as an organizer, then assistant president and from 1966 as an international vice president. He directed the union's political and legislative activities and as head of its union label department coordinated the union's boycott campaigns.

From January 1977 until his election as IUD president, Samuel was deputy under secretary of labor, directing the U.S. Labor Department's International Labor Affairs Bureau.

Samuel has been active in politics, serving as a delegate to state and national Democratic conventions, and has served on several government commissions and on the boards of numerous community organizations. A graduate of Dartmouth College, he also co-authored two books on government.

Elmer Chatak
Secretary-Treasurer

Elected IUD secretary-treasurer in September 1979, Elmer Chatak is responsible for administering the financial affairs of the department as well as providing direction to its organizing and coordinated bargaining activities. Since 1951, he has been involved in union organizing campaigns, first on the CIO staff for five years, then with the United Steelworkers.

The USWA loaned Chatak to IUD in 1963 to serve as organizing coordinator for the Mid-Atlantic cooperative organizing campaign, directing a staff of 35 organizers from 20 unions. His win record of 153 of 197 campaigns covered 31,500 new members.

In 1968, Chatak returned to USWA to establish an organizing department and serve as the first director, a post he held until being elected IUD secretary-treasurer. During that period, about 3,000 bargaining units with over 250,000 workers were organized into the union.

Chatak was born on December 15, 1929, in Acmetonia, Pennsylvania.

My name is Howard D. Samuel, and I am president of the Industrial Union Department of the AFL-CIO, a semi-autonomous member of labor's family, representing 55 affiliates and approximately five million workers, largely in the industrial sector.

I am pleased to have this opportunity to testify in support of H.R. 3997, the National Policy and Technology Foundation Act.

The legislation you are considering faces up to the stark facts which our nation must recognize and confront:

First, that our economy is no longer insulated from the economic activities of the rest of the world;

Second, that neither our concepts and perceptions nor our public and private institutions have kept pace with the new global imperatives;

Third, that as a result we have been steadily losing our ability to compete in the world of international trade as it exists today.

Is there any doubt that our competitiveness problem is pervasive and long-term? For a while some economists and a few political leaders were insisting that the problem rested exclusively with a few obsolete industries--which they say, we would be better off without anyway--or was merely a temporary concern linked to the over-valued dollar.

Neither of those claims stood up before the facts. Today some of our most serious problems are being felt by such technologically advanced industries as communications, computers and aerospace. And the loss of our competitiveness began 20 years ago, long before the over-valuation of the dollar, and that loss is continuing almost unabated today, as the dollar declines.

The subject is one which is all too familiar to America's working men and women. As you well know, we are on the front line of the economic struggle with our trading partners, and we are the ones who have been the first and most serious victims of the steady series of losses we have suffered in this struggle for the past two decades.

American workers, unfortunately, do not have a wide range of options to choose from when our industrial sector begins to lose market share--either here or abroad--to our competitors. Workers cannot acquire another company in order to diversify, or close plants in the United States in favor of manufacturing facilities abroad, or shut down assembly lines making obsolete products.

Workers have only their skills and experience and desire to support their families, and that's where they have to make their stand. In too many cases, amounting to two million or more, their options ran out; they lost their jobs, and suffered long periods of unemployment, in many cases dropping out of the labor force entirely.

The cost can be counted in human terms, in broken families, despair, illness and alcoholism, suicide, and dying communities. And it can be counted in economic terms, in lost production and tax revenues, trade and budget deficits, diminishing productivity and a declining standard of living.

Since we were among the first to feel the impact, the labor movement was among the first to respond. Coming from an industry which was the earliest to suffer from the new international economic order--the apparel industry--I can tell you that we very quickly shed our innocence about comparative advantage and free trade. Those wonderful principles of the 18th and 19th centuries lost their charm in the face of exploited foreign workers, foreign government subsidies and dumping practices, and hidden quota arrangements.

As the impact of international trade began to be felt in a growing spectrum of industries, we in the labor movement several years ago began to review our conceptual approaches, and look for new institutional arrangements to enable a free market economy such as ours to meet the challenge posed by other countries which had no reluctance about government intervention on a massive and systematic scale.

We knew that our democratic society could not import, intact, the institutions or practices of other nations with different traditions--but we also knew that we had to develop new approaches of our own. Business as usual was not enough.

The result of our deliberations is a comprehensive program, approved by the Industrial Union Department and later by the AFL-CIO, which seeks to bring together all the elements affecting our competitiveness into one strategic approach.

The key to our program is a framework which would permit and encourage the private sector--management, labor, the community--to establish a dialogue among themselves, and with government, to share information and experience, to analyze our problems, and to develop if possible an agreed-upon set of remedies.

Such a framework should be created not only for the industrial sector as a whole, but also for individual industries, each of which has experienced a different set of problems.

Would this open the door to an impermissable degree of government interference with business? Some of our critics in academa and even in business have seemed to think so. I must confess I was astonished at the complaints. Government in America, at the federal, state and local level, already intervenes into business and the economy, on a massive basis. It would take a very large volume to list just the impact of federal involvement on the economy as a whole, as well as in specific sectors and industries, in terms of regulation, tax and trade policies, subsidies, special rules and laws. It's nothing new; theories underlying these interventions date back to Alexander Hamilton, our first Secretary of the Treasury, and to such early notable Congressional leaders as Henry Clay and John C. Calhoun.

Unfortunately, because we are still wedded to the free market ideal in theory, if not in practice, many Americans have tended to deny the extent of government intervention, to pretend that it doesn't exist. As a result, many of our government programs and policies are illogical, contradictory and even counterproductive.

The goal of the bill you are considering, therefore would be not to necessarily introduce an expanded dimension in the government's role, but to make it systematic and effective.

Are these concepts and proposals merely a self-serving program for American labor, interested only in preserving our current jobs and conditions in the face of a changing economic climate?

As the principal sponsor of H.R. 3997 indicated in his statement supporting the introduction of the bill, in recent years a broad consensus appears to be forming behind the establishment of a framework which would institutionalize such a public/private dialogue.

One of the earliest examples was a document published by the Labor/Industry Coalition for International Trade, representing a dozen and a half major corporations and international unions.

LICIT was quite optimistic in its references to past experience, and pointed out that the history "of the Steel Tripartite Committee from 1978 to 1980 offers positive lessons on the potential for labor-management-government cooperation in finding solutions for problems facing individual American industries. More broadly, cooperative efforts by industry and labor, such as LICIT, have convinced those of us involved that an often surprisingly broad range of consensus exists (or can be developed) among labor, management and government affecting the future of American industry."

In 1984, the Center for National Policy created a broadly representative study group, which published a statement on Restoring American Competitiveness. Study group members included such business leaders as Felix Rohatyn, senior partner of Lazard Freres & Co., Irving Shapiro, former chairman of Dupont, W. Michael Blumenthal, former secretary of the Treasury and chairman of the Burroughs Corporation, Ben W. Heineman, Sr., president of Northwest Industries, Lee Iacocca, chairman of Chrysler, and Robert McNamara, former president of the World Bank.

Let me quote one paragraph summarizing this element of the study group's report:

"To compete successfully in world and domestic markets populated by foreign industries backed by their own governments, the United States should have a process that permits negotiation among all affected interest and agreement on strategies for growth. To be effective, any strategies must be based on consent, not governmental direction. But a complex bargain of this sort--a strategy for growth negotiated among business, labor, federal, state and local government, and other affected interests--is feasible only if there is an institutional structure in which the parties can come together. The initiative may come from the industry or labor groups. The federal government's role should be to make the tradeoffs necessary to share both the benefits and the responsibilities of growth and change."

You are all aware of the report of the President's Commission on Industrial Competitiveness. As you know, the Commission was chaired by John Young, chairman and chief executive officer of Hewlett Packard, and included among its 30 members 20 other distinguished leaders of business and financial organizations. I was one of two representatives of organized labor. Let me quote briefly from the Commission's report:

"The need for finding consensus on a national level is acute. The competitiveness issues facing America today are not new, yet they remain unresolved. The ability of the political decision making process to deal with them is impeded by conflict among the very sectors needed to solve the problems we face. Policymakers must deal with widely disparate points of view presented by a diversity of interested parties. Often there is not even agreement as to the facts of the issue, much less a shared understanding of tradeoffs involved in the policy options under discussion....

"Mechanisms should be developed for building consensus among key sectors of society to better respond to our competitive challenges."

Let me close, Mr. Chairman, by referring to a specific example of the consensus and cooperation that your bill could well promote. Several years ago the leaders of my union, the Amalgamated Clothing and Textile Workers Union (ACTWU) persuaded a number of industry leaders in the men's apparel industry that unless technologial improvements were to be encouraged and implemented rapidly, foreign competitors--boasting extremely low labor costs--would capture the U.S. market. Labor and management together then approached government, and eventually persuaded the Department of Commerce to help share in the cost of developing new technology through the Tailored Clothing Technology Corporation. All told, the three sectors , labor, management and government, have raised a total of $8 million for the effort--but it has taken five years to do it.

Meanwhile, the Japanese government was undertaking its own consensus-building operation, and in no time at all had committed $60 million to the same goal.

I do not suggest that this bill, or any legislation, can or should try to create a mirror image of Japanese competitiveness strategies in the United States. But the time is growing short for us to at least develop our own strategies to achieve the same capability, and this bill is a worthy first step.

Mr. **Brown**. Thank you very much, Mr. Samuel. I appreciate that, and appreciate particularly the fact that you have been involved in this area through your service on the Young Commission and are familiar with the thinking that has gone into that, and, of course, familiar through your own problems in the labor movement with the critical importance of doing something about it.

Dr. Rosenstein, obviously we have saved you for last because we expect you to not only sum up the need for this, but to outline the strategies by which we are going to convince the administration to move forward aggressively in approving it.

STATEMENT OF DR. ALLEN B. ROSENSTEIN, PROFESSOR OF ENGINEERING, UNIVERSITY OF CALIFORNIA AT LOS ANGELES

Dr. **Rosenstein**. Thank you, Mr. Chairman, and members of the subcommittee.

I have promised Mr. Brown that I would not be brief.

The National Policy and Technology Foundation Act is long overdue. In fact, I would say that H.R. 3997, by my calculations, is 200 years overdue. This is an important bill. H.R. 3997 would provide answers to operational deficiencies in our most basic institutions, deficiencies that threaten the long-term economic foundation and life quality—that of life in the United States—the quality of life in the United States.

I really enjoyed the presentations of Professor Lodge and Mr. Samuel. They were excellent. I can only find one small detail on which I could disagree with them. America's industrial decline is not 20 years old. It is now in its fourth decade.

In 1966, which is exactly 20 years ago, there were 122 U.S. basic industries, from ships, to automobiles, to textiles, to clothing, which employed 35 percent of the industrial working population. At that time these basic industries, where we formerly dominated world trade, were running a deficit of $7 billion, and that was at a time when $7 billion was a lot of money.

The only reason we were unconcerned at that time is that there were a handful of industries, such as aircraft, electronics, computers, agriculture, and chemicals, which ran such a strong, positive balance of trade that in net we had a positive balance.

Now, when I came across those statistics, I was quite puzzled. It took me a long time to understand what labor-intensive agriculture had in common with such high technology things as high-performance commercial aircraft, computers, and electronics.

And finally one day it dawned on me, they did have a great deal in common. It turns out that those industries which were failing had, without exception, adopted the adversarial mode of operation, while those industries which were succeeding, with the possible exception of the chemical industry, had all found through design or accident a cooperative mode of operation whereby there was a standing arrangement between government, industry, academia, and the professions of extensive and far-reaching cooperation.

In other words, those industries which had found a cooperative mode of operation were outstanding successes, and those which had not found this cooperative mode, without exception, were failing.

To look at the dreary statistics which are a consequence of this four-decade decline, in the past 22 years the income of the average American worker has dropped $2.37 per week in constant 1977 dollars.

That doesn't sound like much, but, in other words, an entire generation has seen no economic progress, and I think this movement is accelerating.

Last year, for the first time in 70 years, the United States became a debtor nation, and we do things in grand style, because, in 1 year, we became the world's No. 1 debtor Nation.

Professor Lodge has described this problem in his book, "The American Disease," and I think it's a wonderful title. I wish I had thought of it.

We have all been guilty at one time or another of treating the symptoms of a disease without attacking the virus or the environment that created the illness. As a nation, we should be concerned with the exploding trade deficit, budget deficits, and the continuing loss of America's trade competitiveness.

But these are all manifestations of the same underlying illness. An efficient cure to the American disease will be effected only when we correct the standing deficiencies in our national institutions.

To paraphrase Mr. Stockman, these budget deficits, these deficiencies that we see, guarantee deficits and more Gramm-Rudmans stretching into the future as far as the eye can see.

The Congressional Record, which I have appended to my testimony, gives an excellent description of the foundation's organizations, functions, and operations. I would like to concentrate first on the Nation's need for coherent national policy and for institutional support of industrial competitiveness.

I would like, then, to turn to the role of the foundation in correcting the inherent structural deficiencies that are immobilizing the nation's policy-making process.

Let me begin—perhaps it is a small digression, but I think it's important—by exorcising the centralized national planning straw man. The first instinct of anyone who looks at this proposal is to throw up your hands and say, oh, my God, that's national planning.

Well, the question is: What is the distinction between planning and policy? It has been not properly made in our country. National policy and centralized national planning are two entirely different matters.

Central planning in any form, or under any guise, is not considered practical or desirable for our society.

However, central planning is not illegal, it is not unconstitutional, it has never been accused of being immoral, and, to the best of my knowledge, it is not even fattening. The facts dictate that large-scale national plans take so long to create and put in place that the dynamics of a modern society render such plans obsolete before they can be implemented.

Central planning is simply not practical or useful.

I do not want the Government telling me how to plan or run my business; at the same time, I do not believe that business or the country is well served by short-term conflicting and often mutually canceling national policy.

Now, the word "national policy" is sort of like ketchup; we pour it on everything when we can't think of anything else, but we should define our terms.

We all know that the ultimate purpose of a democratic state is to assure the highest possible life quality for its citizens consistent with the demands of the national security. In this context national policy exists to express and serve the Nation's goals and aspirations.

In turn, the Nation's legislators have responsibility to create the economic, societal, trade, tax, educational, and so forth, policies that collectively form the framework of national policy in which individuals and corporations must conduct their business.

The future of a nation is largely dependent upon the vision provided by national policy, its consistency with reality, and the efficiency that national policy imparts to the national decisionmaking and resource allocation process.

As a citizen and an entrepreneur, I do not want my Government to plan for me, nor do I personally believe in special treatment. I do expect the Government to efficiently perform two indispensable functions that can be offered only by the Federal Government.

First, I look to my Government to aggressively—and I don't mean passively; I mean aggressively—provide a level national and international trade playing field in our collective interests. American industry needs access to financing, interest rátes, tax rates, an educated population, advanced technology, and production techniques that are, at least, equal to, or hopefully better than that available to our competition.

Unfortunately, we are here today because, beginning with the availability of trade and technology information and continuing through financing and interest rates, American industry now operates at a substantial—and I mean a very substantial—disadvantage with respect to its international competition.

We have grown complacent. We are so used to having all of the advantages, we do not realize that we have conceded practically all of them. American industry is the disadvantaged activity.

One small example: the Japanese businessman has more information readily available to him on computer terminals about American industry and American business opportunities than his American counterpart.

I have found that I can obtain information about national conditions and international conditions more readily by calling my friends in JETO—that's the Japanese External Trade Organization—than I can find through any comparable American organization. And I have available to me all of the resources of the U.C.L.A. Research Library, and I have given up using these facilities because I can obtain information so much faster and so much more accurately and easily from my Japanese friends.

Second, and most important, the government must reform its national policymaking process to provide consistent, compatible, relatively stable, and highly visible national policy. Few, if any, of the criteria for constructive national policy in the Nation's long-term interest are satisfied today.

U.S. national policy is too frequently short-term, improvised, ad hoc, subject to special interests, often mutually contradictory, and frequently invisible. I can think of some more terms, but that should cover it.

Now matter how detrimental national policy may become to the nation's interest, Professor Lodge has pointed out that business will always strive to make and will frequently succeed in finding the proper decisions to ensure business survival.

If monetary policy makes it impractical to continue manufacturing in the United States, industry will simply move offshore. Business can only respond to the national policy as it exists. If the results are not in the Nation's interest, so be it.

From the societal standpoint, the most intolerable, and in the long-term destructive situation is that of invisible and/or inconsistent policy. Such policy renders rational decisionmaking impossible or, at best, impractical and inefficient.

Americans at all levels tend to ignore or deny the role and importance of national policy. Implicit in the current movement to get the government off the back of business and free industry from government regulation is the concept that government has or should have little connection with the conduct of the Nation's business.

Generally ignored is the fact that rational private planning and investment cannot be made independent of government policy. In reality, the very rationality of a business decision is dependent upon its consistency with national policy. Conversely, in the face of inconsistent, incoherent, or invisible national policy, private planning and investment becomes a high-stakes gamble instead of a reasoned exercise.

The intrinsic and indispensable place of government policy in private public decisionmaking can be illustrated by a personal example, which I doubt if I will ever forget.

As a chairman of the board of a small high-technology electronics company, I have the responsibility for formulating the corporation's long-term investment policies. It's probably the most important single activity and responsibility that I have.

One year ago, I faced two very clear and very critical investment alternatives whose relative merits depended almost entirely upon the exchange rate of the U.S. dollar. If it was the Government's policy to allow the exchange rate to remain anywhere near its then level for another 5 years, the company had no choice: it would close its American plant and follow most of its American competitors who were already manufacturing abroad.

Left behind would be a work force to produce the raw materials that advanced countries would ship back to us as finished goods along with their tourists.

On the other hand, if Government policy over something like, say, a 2-year period, was to reduce the exchange rate to that of only 4 or 5 years previous, the decision again would be clear cut: we would cancel any overseas plans; we would invest heavily in automation, computerization, and flexible manufacturing in American plants with full confidence in our ability to compete successfully in world markets.

In June 1985, which is exactly 1 year ago, I came here to Washington to obtain the required policy information. My investment dilemma was discussed with members of the administration and Congressmen from both parties.

We pointed out that we were not asking for tax breaks, protection, special incentives, or subsidies. All we asked for was one bit of information in order to make a proper investment decision, and we were willing to make that decision and take the responsibility. However, we needed to know: what is our Government's exchange rate policy. We didn't think that was too much to ask of our Government.

Lacking this knowledge, a routine investment decision became an unacceptable gamble, placing at risk 30 years of effort and the livelihood of 500 employees. The answer to that policy could not be found at that time in Washington. No one knew, or would even guess, at the Government's future exchange rate policy. What was even more disconcerting, no one knew if the policy question would even be addressed.

Well, as you know, by September, the mood in Washington had changed completely. Congress returned from its recess with the message from its constituents; the public had notified its representatives that action must be taken to curb the ballooning trade deficit. A $150 billion and growing trade imbalance represents just too many American jobs that had gone offshore.

Congress responded by introducing protectionist measures. The administration reacted by reciting the virtues of free trade and taking steps to reduce the exchange rate.

Unfortunately—again, as Professor Lodge has pointed out, lowering the exchange rate may slow, but it certainly will not stop, the rout of American industry. There are too many other disadvantages that we enjoy that just changing the exchange rate will not make too much difference.

Even the most ardent proponents of protectionism, will agree that it is a short-term delaying action to allow more long-term effective measures to be taken. The present situation is a tragic commentary upon a great nation. At this late date, and with the situation so far advanced, both the President and the Congress provide only knee-jerk reactions.

The best our leadership can offer are short-range answers without promise of addressing or understanding the underlying causes.

The policy vacuum is painful, expensive, and detrimental to the future health of our nation.

But turning now to the policy and technology foundation. The business of the foundation would be to provide the Congress with tools that have been missing for the past 200 years. Means will exist for Congress to create and maintain consistent integrated policy in the long-term national interest.

Congress will have the instruments needed for the rationalization and revitalization of the Nation's national policymaking process. Civilian agencies will exist to support the technology attendant to national policy and level the international trade field.

The foundation would not be a reorganization. I would rather use the word consolidation. It would consolidate into a coherent body existing agencies and bureaus now scattered in uncertain homes throughout the Government. These agencies would bring their present budgets with them. Their present budgets are over 80 percent of the foundation requirements. This means that 80 percent of the foundation is actually already funded.

Now, just looking at the cost, I am struck with the fact that the additional funding for the foundation would be something in the order of $100 million. Our friends from the Defense Department and I agree with their friend from Japan who said that industrial policy is administered in the United States by the Department of Defense, and in many cases they have been very far-sighted. They have created a number of America's great industries. Certainly our electronics industry came as a result of initiatives that were taken by the Defense Department.

But they pointed out that they have petty cash of $130 million which are being devoted to the development of industrial techniques. The whole foundation would require additional fresh money in the order of about $100 million.

The present trade bill recommends $500 million for retraining, $500 million for science and math education, and $300 million for a war chest to combat the policies of our competitors. That is $1.3 billion to take a stab at bandaiding the present problem.

The foundation, with $100 million, would address the problems directly.

The foundation is especially designed to address the consensus issue and legislative gridlock problems so clearly identified by the President's Commission on Industrial Competitiveness and exemplified by Gramm-Rudman.

Some years ago, Tom Murrin, who is considered one of America's leading industrial managers—he is the president of the Westinghouse Corp.—wrote that meeting the Japanese challenge is beyond the reach of any one company. Even if every major corporation in the United States were to undertake programs to improve their productivity and competitiveness, their efforts would not suffice.

Murrin said, what is lacking is an effective mechanism to bring the leaders of society together on neutral ground in pursuit of common goals. Murrin concluded—and this was a number of years ago—we in the United States need to consider adopting a consensus base policy formulation mechanism.

These words were echoed almost verbatim in the recommendations of the Young committee. The foundation would provide the neutral grounds that Murrin has talked about. Independent councils external to the foundation would provide consensus-based policy formulation mechanisms. These councils would offer Congress the flexibility and resources needed to rebuild our ailing national policy process.

The reasons for America's accelerating decline are easily discernible. Our basic institutions were designed for an agrarian nation that no longer exists. At the present time, the Nation's policy machinery is incapable of meeting the needs of a modern industrial nation. The Nation's policy data base is in shambles. Means do not exist to assess policy interactions and the long-term consequences of policy alternatives.

Faced with the legitimate but conflicting interest of large constituencies, there are little means for Congress to determine an equitable distribution of the necessary sacrifices and develop the required public consensus.

In the case of the Federal budget, we believe that Gramm-Rudman-Hollings will go down in history as a monument to legislative gridlock. With Gramm-Rudman-Hollings, Congress has passed a law ordering itself to exercise its constitutional obligation to provide a rational national budget.

I am confident that H.R. 3997 will be modified and improved before it is adopted. I am also certain that the Nation's accelerating loss of industrial leadership and life quality will not be turned aside by minor extensions of existing programs.

We are far too down the line, we have lost too much ground. Small extensions, small modifications, are not going to be adequate to handle a problem of the magnitude that now confronts us. Until the Congress and the administration prepare the Nation's policy and technology facilitating machinery for competition in the 21st century, the present 40-year decline will continue.

Thank you.

[The prepared statement of Dr. Rosenstein follows:]

TESTIMONY OF

Allen B. Rosenstein

Chairman of the Board
Pioneer Magnetics, Inc.
Pioneer Research, Inc.
Santa Monica, CA

Professor of Engineering
University of California
at Los Angeles

on

HR3997

The National Policy and Technology Foundation Act

before the

Subcommittee on Science, Research and Technology
of the Committee on Science and Technology

United States House of Representatives

June 26, 1986

TESTIMONY ON HR 3997

The National Policy and Technology Foundation Act

Allen B. Rosenstein

June 26, 1986

Mr. Chairman and members of the Subcommittee. My name is Allen B. Rosenstein. I am Chairman of the Board and Founder of Pioneer Magnetics,Inc. and Pioneer Research, Inc. of Santa Monica, California. I am also Professor of Engineering at the University of California at Los Angeles. My biography is appended.

I would comment on HR3997 as follows. The National Policy and Technology Foundation Act is important legislation that is long overdue. HR3997 does not seek to restore America's economic and industrial leadership by concentrating on limited though important elements of the problem such as improving some specific aspect of applied research and development. Instead, the Foundation goes to the long term heart of the problem to address the inherent structural deficiencies of our basic institutions that threaten the economic foundations and life quality* of the United States. The business of the Foundation is to revitalize the national policy making process and to support technology attendant to national policy. National policy in the context of this testimony is the composite of economic, societal, business, trade, tax, educational, etc., policies that collectively provide the policy framework in which the nation operates.

* The life quality of a country is considered to be the combined effect upon the citizens if a nation's health, social, physical, educational, housing, work, civil, public safety, etc., environments.

The present four decade long erosion of the nation's industrial base and relative life quality are the inevitable consequences of 200 year-old institutional and structural voids that render the national policy making process incompatible with the demands of a modern nation. We have witnessed numerous manifestations of the breakdown of the national policy making machinery in past years, ranging from the Social Security crisis of two years ago to today's massive trade deficit and Gramm-Rudman-Hollings legislation.

Debating individual current national issues in the hope of finding solutions is self-deceptive for in reality, the issues are only expressions of deep-seated problems. Inability to compete in world markets is but one symptom of the underlying malady. Loss of U.S. competitiveness in world trade has been proceeding for at least 40 years under the stewardship of both parties and a great variety of micro and macro economic policies. In recent years, the process was accelerated by U.S.macro policies that eliminated most of the remaining incentives to manufacture in the United States.* However, with the exploding trade deficit and the concurrent loss of American jobs, the public has finally become aware that America's economic future and life quality are at risk.

As a consequence of the inability of the national policy process to meet the policy requirements of the nation, we are witnessing a significant long term regression of the American way of life. Perhaps the most telling statistic is provided by the recent Bureau of Labor report which found that the income in constant 1977 dollars of the average American non-agricultural worker has declined from $174.34 per week in Jan., 1964, to $171.96 per week in Dec., 1985. In other words, the real income of the average American worker has lost $2.32 over a period of twenty-two years and is still declining.

* The Hollow Corporation. Business Week. March 3, 1986. Pages 57 to 86.

We used to believe that every generation would have a better life than that of its parents. Professor George Lodge disagrees. Lodge says the present generation is facing what he has called the American Disease--a disease that would deny both economic and life quality advances. Rather than treat current manifestations of the American Disease, HR3997 goes to its root causes--the immobilization of the nation's policy making process--to seek a long term resolution that is in keeping with our democratic traditions.

NATIONAL POLICY - SUBSTANCE AND ROLE

Today there is considerable controversy over the place of national policy in the governmental process. In fact, we find that within legislative bodies there is question of the nation's need for integrated policy and whether there is any requirement for consistency among government policies. The legislation we are considering today and the dialogue it has generated, is a consequence of the absence of an effective comprehensive process to deal with such questions. The following assumptions are offered to highlight the issue by defining the desired substance and role of national policy.

1. The ultimate purpose of a democratic state is to insure the highest possible life quality for its citizens consistent with the demands of national security. In this context, national policy exists to express and serve the nation's goals and aspirations. In turn, national leaders and legislators have responsibility to provide the policies that collectively form the framework in which individual and corporation can effectively conduct their affairs.

2. Successful private investment, resource allocation and decision making cannot be made independent of national policy. The very rationality of personal, business, and government decisions is dependent upon their consistency with national policy. Conversely, in the face of inconsistent, incoherent or invisible national policy, private planning and investment becomes a high stakes gamble instead of a reasoned exercise.

3. National life quality and business-economic policy are in reality inseparable and interactive. The resources required to maintain the desired national living standard are a direct product of the composite of economic and business policies. A nation always seeks an acceptable balance among the resources devoted to improve the current quality of life and the resources invested to maintain the present and insure the future economy. But the distinction between life quality and business policies often blurs. Education and literacy are considered social benefits yet it is apparent that America's 20 percent illiteracy rate impairs our industrial efforts.

Japan quickly learned that pure industrial-economic policies were counterproductive--rapidly degrading the physical environment and impairing the nation's health and life quality. Japan's MITI is now intensely interested in the quality of national life and is incorporating life quality goals into its "Visions of the 1980's" policy statement. As a consequence, the new Japanese Technopolis program is designed around an interesting combination of economic and life quality policies.

THE POLICY PROBLEM

Since effective national policy depends upon a suitable data base, assessment of alternatives, a public consensus and adequate implementation agencies, it is apparent that the Congress and the Administration do not possess adequate tools to properly discharge their national policy responsibility.

Institutional deficiencies at the national level effectively prevent the country from rationalizing national policy. Policy conflict begins at the data level with micro information gathered by very specialized agencies charged with making micro policy. There are no mechanisms to gather data on a more global basis, assess the consequences of both micro and macro policy and propose the modifications necessary to create integrated, coherent and consistent national policy in the long term public interest. Changing conditions are not anticipated, the long-term consequences of existing or proposed policy are not assessed and in the end, a self-consistent, highly visible national policy structure is not achieved. Frequently, lacking adequate civilian institutions to facilitate needed technological advances, the nation must often choose between improvising or applying a military overlay to a technological program.

National policy is almost entirely reactive. The long term decline in international trade competitiveness is recognized only after much of American industry has been driven off shore and runaway trade deficits have made the U.S. a debtor nation for the first time in 70 years.

It is at the policy structure level that the U.S. institutional deficiencies become most painful. Means do not exist to consider much less assess the interrelationship between national macro policies such as monetary policy, inflation policy, trade policy, industrial initiatives, tax policies, saving policy, life quality policies, etc.

Traditional remedies have failed. The time has come to adopt serious bipartisan initiatives such as the proposed policy Foundation. The United States cannot tolerate the inefficiency of centralized planning nor can it afford the cost of national policies that are mutually non-supporting of the national interest and that often prove conflicting and frequently counterproductive.

Trade Policy Example

International trade competitiveness is typical of the complexity of the national policy issues that the U.S. policy process can no longer master.

Following WWII, trade practice began to change. The entire world has slowly but surely evolved toward a single global marketplace with new contenders playing by different rules. The increased mobility of capital and technology wiped out much of the substantial comparative advantage previously possessed by advanced nations. No longer could the deployment of capital and technology be controlled by a few countries. International industrial competition has become a contest between nations that has little resemblance to our classical image of the rugged entrepreneur or business slugging it out alone. The escalating cost of advanced development has made it impossible for many individual corporations to undertake by themselves, creation of the next generation of machines, processes, etc. (Japan is said to have invested $1.2 billion in their VLSI chip program. The U.S.'s DOD counterpart is funded for close to $400 million.) Laws, social models, ideologies and institutions which were effective in the development of our domestic economy have often become counterproductive in international trade.

With the superposition of a substantial and growing external world trade economy, the game became much more complicated. The new dislocations go well beyond the traditional requirements of trade and commerce. Domination of rapidly growing international markets now demands capital investment rates that cannot be satisfied with conventional equity financing. Trade competitors meet their capital requirements by inventing new tax and industry financing policies. U.S. industry struggles to compete with traditional financing often made more costly and less available by national monetary and tax policy. Demise of older industry and the swift rise of new technologies places changing demands upon the entire educational structure while asking for displaced worker retraining policies that we do not yet possess.

Today, the United States needs means not only to maintain dynamic trade policies, but to develop the entire web of supporting policies that range from education to finance and taxes. The forces that buffet our economy are characterized by the rate at which they change. Entire new industries become major factors in international trade in less than a decade. An advanced nation that attempts to maintain a basically reactive or defensive posture will quickly become an industrial backwater. Means to anticipate both problems and opportunities well in advance of their realization, have become a necessity.

Saddled with crippling institutional rigidity and deficiencies, America faces a still accelerating industrial, economic and life quality decline. Lacking institutional means to gather the required international data base and create consistent national policy, the nation dissipates its resources in conflicting, incoherent, ineffective micro policies. Without a public consensus-driven policy mechanism, the legislative process drifts with increasing frequency into gridlock when faced with massive national issues.

Legislative Grid Lock - The Need for Public Consensus

In the 1980's a new legislative phenomena appeared. Extensive constituencies have appeared with legitimate interests in such strong conflict that they have become irreconcilable through the traditional legislative process. The inability of both Congress and the President to respond in 1984 to the impending bankruptcy of the Social Security System provides a classical example of what we would call the "Social Security Syndrome " or "Legislative Policy Gridlock." We postulate that these enormously complex issues which stymie the conventional political process are destined to become ever more commonplace. They will require creation of new policy mechanisms.

The Social Security problem was unique in that there was little argument over the basic facts. Social Security revenues would not meet projected expenditures. Bankruptcy was inevitable unless the Social Security Act was amended. Months of debate left only a legislative policy gridlock. Neither Congress nor the President were able to reconcile the very real requirements of social security pensioners with the equally pressing needs for tax relief and budget containment. The political risks attached to the various proposals were obviously unacceptable to the elected players.

Resolution of the issue was finally obtained by going outside the Government to a Council of especially qualified citizens chosen to give proper representation of all concerned parties. After suitable review, investigation and extensive public debate, the Council developed a comprehensive proposal that was then submitted to the Congress. Congress with visible relief passed the measure which the President immediately signed into law. The wisdom and good judgment of the Council in equitably distributing the necessary sacrifices among the effected parties would seem to be evidenced by the speed in which the Social Security bankruptcy question disappeared as a public issue.

Although the policy conflicts of Social Security financing led to legislative gridlock, that problem seems insignificant when we consider the intricacies and interrelations of international trade policy, inflation policy, budget deficits, trade deficits, national life quality policy, etc. The lessons learned from Social Security should not be forgotten and now wait to be applied to the trade and budget deficit crises. The nation has need for well qualified, respected bodies to serve as deliberative public forums for national policy. These bodies would provide the extensive public debate needed to create the consensus that can only be obtained when the public perceives that fair adjustments have been made among all of the legitimate but frequently conflicting interests.

The nation's leading trade competitors have long enjoyed well established institutional means for obtaining a public consensus. Germany's Stability and Growth Act of 1966 established a tripartite consultation process among labor, business and government. Japan's MITI has thirty-five associated interdependent Councils with over 200 standing committees that reach every walk of Japanese life.

A major structural gap exists in our present institutions. There is no accepted organizational arena in which the tradeoffs among policy options can be publicly debated and a broad based consensus achieved. Without adequate mechanisms for achieving public consensus on national policy issues by equitably distributing the necessary sacrifices among the effected parties, legislative gridlock will become more prevalent.

THE NATIONAL POLICY AND TECHNOLOGY FOUNDATION

HR3997 provides the Congress and the Administration with a non-partisan resource--a Foundation that enables our elected officials and representatives to rationalize and revitalize the nation's policy making process. Cooperative policy facilitation in the national interest would be institutionalized. (Foundation organization and functions are detailed in the Congressional Review of April 24, 1986, appended.)

America needs the means to recognize world changes that will require adjustments in its national policies, and it needs the means to effectively initiate and facilitate policy change. With continuously changing world conditions and international competition that change its policies and strategies to match the changing market, it becomes axiomatic that the United States must also be able to readily reshape its policies and institutions for compatibility with the changing times.

The question of policy responsibility cannot be raised too often. Our distinguished elected representatives would probably agree that national policy is much too important to be left solely to the discretion of politicians. Yet it was Charley Sporck of National Semiconductor who asked many years ago, "If the government is not responsible for national policy, who is?"

The central and indispensable role of national policy in the conduct of both our public and private affairs requires very visible processes to create and maintain national policy that does not now exist. When faced with complex, legitimate and conflicting demands, our national institutions are inadequate, often causing the political process to fail. The President's Commission on Industrial Competitiveness (Young Commission) stated:

> "Consensus is vital. The need for finding consensus on a national level is acute. The competitiveness issues facing America today are not new, yet they remain unresolved. The ability of the political decision making process to deal with them is impeded by conflict among the very sectors needed to solve the problems we face. Policy makers must deal with widely disparate points of view presented by a diversity of interested parties. Often there is not even agreement as to the facts of the issue, much less a shared understanding of the tradeoffs involved in the policy options under consideration". (Underline added for emphasis.)

The Young Commission recognizes that our policy makers while finding themselves in an adversarial arena, must frequently operate without a commonly accepted set of facts or a shared understanding of the tradeoffs of the policy options. To rephrase the Commission's statement in terms of institutional deficiencies, the nation does not have the means to develop an adequate policy data base, formulate and assess policy alternatives, or generate the national consensus necessary for public acceptance. In addition, adequate institutional means frequently do not exist to implement or facilitate important national policies.

The Foundation is designed to address the consensus issue and associated legislative grid lock problems so clearly identified by the Commission and exemplified by Gramm-Rudman-Hollings.

Some years ago, Tom Murrin, President of the Energy and Advanced Technology Group of the Westinghouse Corporation and a member of Young Commission wrote:

> " Meeting the Japanese challenge is beyond the reach of any one company. Even if every major corporation in the U.S. were to undertake programs to improve their productivity and competitiveness, their efforts would not suffice ...
>
> "When government, management, labor and academia all work in a cooperative complementary fashion toward shared objectives, the most difficult challenges become manageable. What is lacking is an effective mechanism to bring the leaders of these facets of society together on neutral ground in pursuit of common goals."

Murrin Concluded:

> " ... we in the United States need to consider adopting a consensus-based policy formulation mechanism."

The Foundation offers Murrin's neutral ground. Independent external Foundation Councils become the mechanism that brings leaders of these facets of society together to seek "consensus-based" national policy.

Supporting the Councils, the Foundation provides a comprehensive international policy data base and first rate policy analysis and assessment resources that evaluate policy alternatives and assess their long term impact and interdependence.

With public recognition and acceptance of the equity of the tradeoffs and sacrifices inherent in the resolution of any significant public issue, the Congress and the President would have renewed flexibility to create and legislate consistent national policy in the larger public interest. Responsibility for the implementation of designated sectors of these policies would be assigned by Congress to cognizant agencies. Where appropriate, and when designated, Foundation resources would facilitate policies and programs of substantial national interest where sufficient timely development cannot be expected from the private sector due to high risk, long lead time or the sheer magnitude of the required resources.

FOUNDATION QUESTIONS

To conclude this testimony, let me briefly review some of the more important Foundation questions that thoughtful individuals have raised.

The Trickle Down Theory of Basic Research and Technological Innovation.

Conventional wisdom in the English speaking nations holds that there is a natural progression from basic research and technological innovation to industrial competence and trade competitiveness. If only enough resources are poured into basic research and technological innovation, industrial competence and international trade competitiveness will automatically follow. There will be no need then for a national policy mechanism or a technology foundation.

Closer examination reveals that today's high mobility of capital, basic knowledge, technology and industrial process has largely severed the connection between the four areas. In many cases the correlation is negative instead of positive. For example, the U.S. leads the world in research and technological innovation as measured by Nobel Science Awards and patents. We also lead the world in international trade deficits. Each of the four areas has different personnel, philosophies, goals, institutions, and in particular, responds to entirely different national policies. As example, the Boeing Aircraft Company is probably the world's most competent designer and manufacturer of commercial aircraft. There is no question of Boeing's technological contributions or industrial competence. Yet for many years Boeing lost market share to Europe's Airbus, largely because of the Export-Import Bank's loan and interest policies.

Our trade competitors have recognized the ultimate importance of industrial competence and trade competitiveness. James C. Fletcher, former and now present head of NASA, in discussing the rapid industrial development of Japan with business members of the Japanese Keidanren was told:

> " ... it was very simple. We made a conscious decision after WWII to develop new technology wherever we could find it; if we had to borrow it, fine; or if it made sense to develop it ourselves, that was also quite acceptable. We did this at the expense of the more basic sciences. As a result, you will notice that the Nobel prizes all went to the United States, whereas the new technology was nearly always applied first, or at least best in Japan."

Japan ignored the conventional wisdom to put in place national policy that insured industrial competence and trade competitiveness.

Central Planning

CENTRAL PLANNING IN ANY FORM OR UNDER ANY GUISE IS NOT CONSIDERED PRACTICAL OR DESIRABLE FOR OUR SOCIETY.

Central planning is not illegal, unconstitutional or even mildly immoral. The facts dictate that large scale national plans take so long to create and put in place that the dynamics of a modern industrial society render such plans obsolete before they can be implemented. Therefore, central national planning is simply not useful.

On the other hand, there is mounting evidence that properly supported national policy facilitating mechanisms can achieve the opposite of central planning. The goal is to ensure that every segment of society not only contributes to national policy formulation, but that the planning and implementation responsibilities which naturally flow from consistent, rational national policy will be executed by the best qualified sectors of the society itself. With adequate visibility each individual and each business will perceive and implement plans consistent with national policy, i.e., a planning society - not a planned society.

Usurping of Powers

NONE OF THE POWERS AND RESPONSIBILITIES OF THE LEGISLATURE OR EXECUTIVE BRANCHES OF THE GOVERNMENT ARE TO BE USURPED OR ASSUMED BY THE NEW ORGANIZATION

The Foundation shall have no legislative or funding authority. Major responsibilities shall be the assessing of existing and emerging national needs and opportunities, evaluating policy alternatives and presenting the results to the President, Congress and Public for the usual review, modification and funding, when found worthy. Subsequent policy implementation shall be the responsibility of appropriate agencies designated by the Congress.

Cost

The Foundation will be created by bringing together and consolidating into a coherent body existing agencies presently scattered in uncertain homes throughout the Government. The current budgets that the agencies will bring with them come to $500 million or over 80 percent of the proposed Foundation's initial allocation. It is expected that the efficiencies to be achieved by the Foundation by for example, the reorganization and streamlining of the information gathering function of the Federal Government, will provide savings well in excess of the $100 million of new money required by the Foundation.

Even without the savings to be realized by increased efficiency, the additional Foundation expenditure pales beside the direct cost of our inability to get our national policy act together. The latest Congressional Trade Bill proposes $500 million for retraining, $500 million for science and math education and $300 million for a war chest to combat foreign trade subsidies. In other words, Congress proposes $1.3 billion to band-aid the consequences of institutional deficiencies that the Foundation with $100 million of new funding would address directly.

Would a More Modest Initiative be Advisable?

A more modest initiative such as substantially upgrading the Office of the United States Trade Representative would certainly be an improvement over the present situation. Unfortunately, a limited local solution does not address the underlying institutional and structural deficiencies that are immobilizing the national policy making process. The loss of industrial competitiveness and the subsequent trade deficit is only one critical manifestation of the more fundamental national policy making problem. The

Social Security crisis of two years ago, and Gramm-Rudman-Hollings and the trade deficit of today, flow from the same two hundred year-old institutional shortcomings. Until the national policy making machinery is modernized, our nation will face a never ending stream of Gramm-Rudman-Hollings as far as the eye can see.

Effective performance of a modern society demands reasonable consistency, compatibility and visibility among its national policies. The web of national policies taken as a whole in essence define the rationality and ultimate success of both individual and corporate decision making and resource allocation. The lack of consistent national policy is adversely affecting the nation's life quality, industrial competence and trade competitiveness, all of which are a direct consequence of the composite of national micro and macro policies. These policies are now created independent of each other and to a large extent in ignorance of their collective effect upon the national well being.

It is no longer possible to resolve or even comprehend substantive national problems such as international trade competitiveness without assessing a wide spectrum of national micro-macro policy. When the House Republican Research Committee sought to establish an "Agenda for Meeting America's Competitive Challenge" their recommendations addressed monetary policy, tax policy, capital formation policy, trade policy, intellectual property policy, anti trust policy, education and retraining policy, national R&D policy and finally regulation policy - a total of at least ten distinct policy areas.

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NATIONAL POLICY AND TECHNOLOGY FOUNDATION ACT OF 1985

HON. GEORGE E. BROWN, JR.

OF CALIFORNIA

IN THE HOUSE OF REPRESENTATIVES

Thursday, April 24, 1986

Mr. BROWN of California. Mr. Speaker, today I wish to discuss for the consideration of my colleagues, the National Policy and Technology Foundation Act of 1985 that I recently introduced as H.R. 3997. Joining me as cosponsors of the bill are Congressmen BEILENSON, BERMAN, BONIOR (MI), CONYERS, CROCKETT, DIXON, DYMALLY, EDGAR, FAZIO, FORD (MI), GUARINI, HAWKINS, HERTEL (MI), LEVINE (CA), Lundine, MacKay, McKernan, Mitchell, Nelson (FL), PANETTA, RANGEL, TORRES, UDALL, WALGREN, WAXMAN and WEISS.

The National Policy and Technology Foundation Act was introduced to focus congressional attention on the need for legislative flexibility and the correction of structural deficiencies in our basic governmental institutions that threaten the long-term economic foundations and quality of life in the United States.

INTRODUCTION

Sometime, nearly four decades ago, with the United States enjoying the world's highest standard of living and a seemingly invincible industrial plant, the Nation's industrial base began to erode and the country's quality of life entered into a long-term decline. Held captive by past success and its own conventional wisdom, the Nation ignored many danger signs. Finally, in the late 1970's and early 1980's the loss of consumer electronics markets, followed by steel and automobiles, made it clear that America's leadership and prosperity were being lost—perhaps forever.

The country is experiencing a broadly based structural phenomena that is indescribable in terms of classical economic models. The regression of American trade and economy are being matched by a concurrent deterioration of the relative American life quality. If the trend of the past 40 years foretell America's future, our children will have much less to be thankful for that their parents.

Industry provides most of the material goods of our society and generates much of the revenues used to finance our social services. However, by almost any standard, American industry is ill and shows few signs of regaining its ability to compete in world markets. The dreary statistics documenting the United States' inability to meet current international competition are too well known to repeat. The LICIT Report of April 1983 presents a grim picture of world market share trends. During the 15-year period from 1965 to 1980, in 12 major manufacturing categories ranging from iron and steel to aircraft and computers, France and Japan each increased their percentage of world market share in 8 categories. West Germany increased its share in five categories and now leads the United States (5 to 4). United States' market share on the other hand declined in 10 out of 12 categories. The result of our eroding industrial competence is a $150 billion U.S. trade deficit for 1985 and a drop in relative U.S. GNP/capita from first place after WWII to 10th place today. The President's Commission on Industrial Competitiveness points out: "Real hourly compensation in the United States has remained virtually stagnant since 1973. Since 1979 it has actually declined."

National life quality is obviously influenced by the national GNP/capita, but the actual quality of life is given by other environments such as education, health, personal security, pollution, etc. In each of these areas, the United States life quality is not outstanding.

Educational test scores have been dropping steadily in the United States while functional illiteracy remains at close to 20 percent. Our ability to allocate our educational resources to effectively serve national needs is questionable. During the past decade, with high technology industry often struggling to satisfy its demand for experienced engineers, California's production of electrical engineers decreased by nearly 30 percent while the output of lawyers increased 300 percent. It would seem that we plan to litigate our way back to industrial preeminence. Japan, on the other hand, produces twice as many engineers as the United States, but the entire country employs fewer attorneys than are found practicing in Los Angeles County.

In spite of our enormous investment in medical research and health delivery, Americans are not relatively healthy. Today the Japanese and the Swedes, contributing little to medical science, are the world's healthiest people with the lowest infant mortality rates and the longest life spans.

In other life quality areas the country is doing no better. Crime is excessive: the average American is more conscious than ever of muggings, burglary and widespread use of narcotics. The Nation's physical environments are being damaged by pollutants. Acid rain is destroying Eastern forests and lakes. Smog levels in our major cities remain high.

WHY A NATIONAL POLICY AND TECHNOLOGY FOUNDATION?

Centralized national planning is neither practical nor desirable for our society. Large scale national plans take so long to produce and put in place that the dynamics of a modern industrial society render such plans obsolete before they can be implemented. Central national planning, therefore, is simply not useful.

On the other hand, only the Government can take responsibility for the creation and maintenance of coherent national policy in the national interest. Rational planning and investment by the private sector, individual and corporate, cannot exist independent of government policy. In reality, the very rationality of a business decision almost inevitably depends upon its consistency with national policy. Conversely, in the face of inconsistent, incoherent, conflicting or invisible national policy, private planning and investment becomes a high stakes gamble instead of a reasoned exercise.

Congressman LEON E. PANETTA of the House Agricultural Committee in the Los Angeles Times, May 12, 1985, said: "Counterproductive and conflicting Federal laws and policies abound in agriculture to the point where they sometimes sound like 'Alice in Wonderland' creations. For example there are: Tax policies that encourage investors to begin raising unneeded, irrigated crops on easily erodible soil in Nebraska using scarce water at the same time the Government is fighting soil erosion and looking for ways to conserve that water."

Allen Paul, President of the Agriculture Council of America observed: "There ain't nobody responsible, nobody accountable . . . We just don't have an integrated farm policy."

The consequences of inconsistent national policy appear everywhere. Monetary policies established to combat inflation contribute to an overpriced dollar that made U.S. goods uncompetitive in world markets and created a $150-billion trade deficit. Conflicting macro policies, which frequently insulate economic sectors from market forces, drive U.S. farmers bankrupt and allowed Argentine wheat to be delivered in Minnesota at less than U.S. cost.

The problem is deep-seated. Institutional rigidity has precluded changes in our basic institutions and institutional deficiencies insured that the need for change was not perceived. The country's present institutional structure is flawed and unsuited for the dynamics of a modern world—lacking means to facilitate the integrated public-private policies so necessary to the country's long term interest.

Policy conflict begins at the data level with micro information gathered by very specialized agencies charged with making micro policy. There are no mechanisms to gather data on a more global basis, assess the consequences of both micro and macro policy and propose the modifications necessary to create integrated, coherent and consistent national policy in the long term public interest.

Although every Government department and most important agencies have policy sections, their scope is generally limited to gathering micro data to provide micro policy for their host. Regardless of capabilities or desire to do more, they are restricted both by the data available and their franchise. Even if adequate data were made available, the United States has not established a formal system for monitoring the international trends and developments that impact our economy and quality of national life. Commercial opportunities arise and are forever lost while economic challenges mature into major crises without an early warning system to alert our Government and industry.

Micro policies proliferate within major Government departments with little analysis of their interaction and collective effectiveness. Macro policy is created, often in response to an ideology, and with negligible assessment of long-term consequences. The experimental and changing nature of national policy is largely ignored. Formal means to evaluate policy consequences are seldom installed. National policy is almost entirely reactive. A 40-year decline in international trade competitiveness is recognized only after much of American industry has been driven off shore and exploding trade deficits make the United States a debtor nation for the first time in 70 years.

It is at the integrated policy structure level that the U.S. institutional deficiencies become most painful. Means do not exist to consider, much less assess, the interrelationship between national macro policies such as monetary policy, inflation policy, trade policy, industrial initiatives, tax policies, saving policy, life quality policies, etc. The Nation does not possess institutions capable of proposing integrated national policy alternatives and assessing their expected long term consequences. Until this deficiency is relieved, the Nation will continue to dissipate its considerable resources and stagger from one avoidable crisis to another.

In recent years the consequences of the Nation's institutional deficiencies have become more evident. Failures of the formal national policy making system have finally culminated in the Gramm-Rudman Act.

Gramm-Rudman represents a massive breakdown of the legislative process. The act was passed by a frustrated Congress unable to resolve a runaway budget crisis. But Gramm-Rudman is not the first nor will it be the last of major national issues for which the Congress and the administration will be unable to provide adequate national policy. Like the Social Security crisis of 2 years ago Gramm-Rudman flows basically from structural and institutional deficiencies and not from a lack of dedication or the desire to perform by the Congress or the administration.

The Nation's leading trade competitors have long enjoyed well established institutional means for developing national policy and obtaining the necessary public consensus. Germany's Stability and Growth Act of 1966 established a tripartite consultation process among labor, business, and government. Japan's MITI has 35 associated independent councils with over 200 standing committees that insure the effective participation of every segment of Japanese society.

Unlike our trade competitors, the U.S. Congress simply does not have the tools to cope with the far-reaching complexity of the problems of a modern global society. Without the means to anticipate pending crises before they become critical, develop an adequate data base, formulate and assess policy alternatives and in particular, generate the national consensus necessary for public acceptance, the United States is assured of a future with more Gramm-Rudmans.

The country needs to put in place the means to recognize world change that will require adjustments in its national policies and it needs the means to effectively initiate and facilitate policy change. Specifically, a consensus-driven mechanism is required to rationalize national policy by anticipating changing conditions, assessing the long term consequences of existing and proposed policy and recommending to the Congress and the President self-consistent, mutually supporting national policies. With continually changing world markets and international competition that shapes its policies and strategies to match the changing market, it becomes axiomatic that the United States must be able to readily reshape its policies and institutions for compatibility with the changing times.

The Nation's policy facilitating agencies are also incomplete. Although the Federal Government now provides substantial funding for science, and technological support for selected industries such as agriculture, aviation and commercial fisheries, we presently lack the institutional capacity and civilian agencies to focus programs upon the competitive performance of our economy as a whole. Congress has responsibility for designating the appropriate agencies to implement national policies. In practice, however, implementation of important policies may languish for lack of an existing competent agency to pursue them. In the broadest sense, the Nation does not possess for our new technology development needs the equivalent of the National Science Foundation or the National Arts and Humanities Foundations. The National Policy and Technology Foundation would consolidate technology related activities which are not now closely tied to an agency mission and would insure that the Federal Government will assume suitable responsibilities for needed civilian technology which have heretofore not been adequately discharged by any sector of society.

The combining of existing governmental functions into a new foundation with responsibility for facilitating national policy and the technology supportive of that policy finds its counterpart in the principal policy agencies for some of our major trade competitors. Japan's MITI is heavily involved in insuring the excellence of that nation's technology.

NEEDS ADDRESSED BY THE NATIONAL POLICY AND TECHNOLOGY FOUNDATION

While it might be convenient to blame the Nation's present difficulties upon one or the other political party or upon a particular ideology, this would belie the facts. Our regression has steadily progressed for nearly 40 years under the stewardship of both parties. The data would demonstrate that the United States is in the midst of a long-term decline resulting from 200-year-old structural deficiencies that render our institutions incapable of discharging the policy responsibilities of a modern society. The rigidity and structural deficiencies of America's basic institutions have existed so long, they are almost impossible to perceive or to question. John Kemeny, Chairman of the President's Three Mile Island Commission, after studing that disaster, was forced to the conclusion that the fault lay more with obsolescence of U.S. institutions than with the reactor operators. "The present system does not work. It was designed for a much earlier and simpler age. The only way to save American democracy is to change the fundamental decision-making process at the Federal level, so it can come to grips with the enormous and complex issues that face the Nation."

To confront most large scale national problems, the Congress has need for effective, nonpartisan institutional means for creating coherent, consistent national policy in the public interest. Indeed, there is often great difficulty in recognizing or even defining long term public interest. When faced with complex, legitimate, and conflicting demands, our national institutions are too often inadequate, causing the political process to fail.

The National Policy and Technology Foundation has been designed as an effective, efficient, nonpartisan national policy mechanism. Existing agencies and bureaus are brought together to provide Congress with the badly needed early warning system, comprehensive policy data base, policy assessment and the public consensus necessary to reduce legislative gridlock. The Foundation draws upon the lessons learned from the policy institutions of our more successful trade competitors and from our own national experience to offer a bipartisan approach to achieving and facilitating integrated national policy.

The number of studies and congressional bills addressing various manifestations of America's loss of economic and industrial leadership has been increasing. The pressures of the times are seen to be forcing the restructuring of the basic institutions necessary to maintain the national life quality and trade competitiveness. The administration has considered two significant reorganization initiatives involving the creation of two new Cabinet level agencies: a Department of International Trade and Industry [DITI] and a Department of Science and Technology. At the same time, thoughtful proposals such as those by the President's Commission on Industrial Competitiveness and the House Republican Research Committee have invariably come to propose major changes in national policy. There has been a direct or at least tacit recognition that the Nation's need to resolve complex national issues such as trade competitiveness requires the addressing of a host of national policies in a coherent manner.

The House Republican Research Committee's "Agenda for Meeting America's Competitive Challenge" targets the process of innovation to improve the Nation's competitiveness. While the agenda does not directly address the general issue of conflicting national policies, its emphasis is upon the broad spectrum of national policies that must come together to improve our trade competitiveness. The impact upon U.S. trade competitiveness of monetary policy, tax policy, education and retraining policies, trade policy, capital formation policy, intellectual property policy, antitrust policy, national R&D policy and regulation policies has been carefully defined. The proposed Foundation is structured to provide long term attention to the national policy issues that the "agenda" has raised.

America's declining ability to compete in the international marketplace is one of the more serious consequences of the structural deficiencies of our country's national policy institutions. The President's Commission on Industrial Competitiveness [Young Commission] dispelled many of our most cherished trade myths. Four institutional policy needs are found in the Young Commission report that coincide with the basic functions of the Foundation. The Foundation would provide:

1. A high quality, comprehensive readily accessed international and domestic information and data base.

The Young Commission observes: "One reason few U.S. firms export is that they lack critical information about foreign markets. Such information currently exists within Government, but it is not readily available."

2. First rate, independent capabilities for the analysis of national problems and opportunities and the assessment of policy alternatives—their interdependence and interaction.

The Young Commission found "The competitiveness issues facing America today are not new, yet they remain unsolved. The ability of the political decision making process to deal with them is impeded by conflict along the very sectors needed to solve the problems we face. Policy makers must deal with widely disparate points of view presented by a diversity of interested parties. Often there is not even agreement as to the facts of the issue much less a shared understanding of the tradeoffs in the policy options under discussion."

3. Highly visible societally representative means for achieving national policy consensus.

The Young Commission recommends "Government can be strengthened significantly by providing a forum in which consensus can be reached on the facts of an issue and in which implicit tradeoffs among policy options can be made explicit."

4. Means to facilitate and implement those policies for which there is no presently existing suitable organization.

The Young Commission wrote ". . . we should be concerned by the fact that the Federal government conducts its R&D . . . in agencies and organizations with no common management. Each research entity has a mission independent of the others and none has industrial competitiveness as a goal."

DESCRIPTION OF THE BILL

The National Policy and Technology Act of 1985 establishes the Foundation as an independent agency in the executive branch of the Federal Government.

STRUCTURE OF THE FOUNDATION

The Foundation would have nine main branches and appropriate independent public councils.

First, The National Information Office.—This office would develop in cooperation with other public and private agencies, the comprehensive, coherent National Information and Statistics Policy necessary to the creation of a National Information System.

Information and data required for the informed, effective operation of the Nation's public and private policy makers would be provided. The basic factors influencing the national economy and life quality would be continuously monitored including United States and foreign Economies, trade, production, market and industrial trend indicators, customs, tariffs, regulations, commodities, energy, market opportunities, technological innovation, scientific advances, industrial competitiveness, industrial policy and strategy, government and business policies, educational policies and resource allocation strategies.

A national computer network with remote terminals would provide ready access to the national data base by public and private users.

The National Technical Information Service of the Department of Commerce would become part of the National Information Office.

Second, National Office of Policy, Analysis and Assessment.—This office would provide a vehicle for comprehensive examination of the U.S. policy structure. Interrelationship of existing and proposed national policies including life quality, societal, economic, industrial, monetary, et cetera, policies and their combined future impact upon the Nation's standard of living, international competitiveness, industrial competence and technological development would be continuously evaluated. Particular attention would be given to conflict between micro policies and the coherence and consistency among macro policies needed to form integrated national policy.

Drawing upon the data banks of the National Information Office, the Policy Office would provide an early warning system to identify emerging national and sectoral problems, opportunities and needs before they assume crisis proportions. In cooperation with existing Federal policy groups and other concerned public and private bodies, critical issues would be evaluated. Alternative policies and programs to resolve national problems, needs and opportunities would be assessed and furnished to the appropriate councils for public reevaluation and debate. The evaluations and assessments of the Office of Policy would serve as points of departure for the public deliberation of the councils. The National Science Foundation's Division of Policy Research and Analysis would be transferred and serve as the nucleus of this office.

Third, Office of National Programs.—This office would undertake the applied research and development required to develop proposed policies in those areas of national concern not adequately supported by other agencies or the private sector. Cooperative industry, government, university and professions programs would be encouraged and facilitated. Commercialization and deployment of resulting new technology would be the responsibility of the private sector. Typical large scale, one time national programs could be the fifth generation computer, the unmanned garment factory, and the very high speed, large scale integrated circuit program which went by default to the DOD. The National Science Foundation's Applied Research and Problem Focused Research Divisions would be transferred to form the initial core program of the Office.

Fourth, Office of the Professions.—The office would support fundamental research in the engineering disciplines and nationally needed development and applied research in public professions not adequately supported from other sources. The National Science Foundation's engineering divisions would be transferred to the Office of the Professions and could constitute the initial programs of the Office.

Many critical national issues require multidiscipline, multiprofession resolution. Mechanisms including cross-disciplinary and multiprofessional activities would be investigated to facilitate implementation of cooperative public-private understandings in the national interest.

Fifth, Office of Institutional and Human Resources Development.—This office would include the Centers for Industrial Technology authorized by Public Law 96–40. The Office would have responsibility to join government, university, industry and professions in cooperative activities including generic development useful to many industries and training of individuals for innovation, industrial competence and international competitiveness.

Cooperative government, industry, university, and Federal laboratory efforts to establish technical and economic feasibility in the matter of Government mandated industrial health, safety, and environmental regulation, would be important activities of the Centers. Technological and societal systems needed for long-term resolution of major industry-environmental questions such as acid rain, would be considered.

Quantitative projections of human resources needs would be made. Training and retraining programs, new curricula and educational institutions to meet these needs along with those caused by technological displacement and the unmanning of the Nation's factories would be proposed. Encouragement and assistance for minorities and women to enter the professions would be offered.

Sixth, Office of Small Business.—This office would materially improve the resources and capabilities of U.S. small business, including upgrading production technology by grants and incentives for cooperative industry-wide development and research, promotion of computerization, training of personnel, et cetera. The small business innovation program of the National Science Foundation would be transferred to the National Policy and Technology Foundation.

A major undertaking would be the creation of the Federal Technology and Professions Extension Service to be the counterpart of the U.S. Agriculture Extension System. Ready access would be provided for individuals, companies and industries to advice, support and expert consultation upon the latest manufacturing processes, management systems, quality assurance methods, production techniques, personnel procedures, computer applications financial controls, et cetera. These programs would be coordinated with existing State technology, professions, or industrial programs to avoid duplication or adverse impact.

Seventh, Office of Intergovernmental Technology and Professions Delivery System.—This office would facilitate the integration of the latest professions delivery system and technology advances into the policy formulation and delivery systems management of State and local governments. Cooperation between government (local and State) with the university's professional schools would be supported. The Office and universities would offer resources particularly suited to massive problems such as solid and toxic waste disposal that go beyond the resources and boundaries of conventional jurisdictions. The intergovernmental programs of the National Science Foundation would be transferred and serve as the nucleus of this Office.

Eighth, National Bureau of Standards.—The Bureau would be transferred intact from the Department of Commerce to serve as an operating laboratory for the Foundation. Present duties and programs of the Bureau are quite compatible with Foundation responsibilities. Where appropriate, mechanisms would be developed to foster public-private partnerships involving the Bureau and the Federal Laboratories in the applied research and development often required for implementation of specific policies in the national interest.

Ninth, Patent and Trademark Office.—The classification, evaluation and protection of invention and technology innovation function of the office makes it reasonable to transfer the Office from the Department of Commerce to the National Policy and Technology Foundation.

Councils.—Superimposed upon the Foundation's structure is a series of independent councils. Council members would be appointed by the Director from outside the Foundation and would include leaders in concerned industry, labor, general consumers and experts from a wide spectrum of society including academia, mass media, finance, government, environmentalists and the professions.

The councils, serving as deliberative public forums for national policy, are the crucial link to the public and the key to the successful function of the Foundation. By serving as an early warning system, offering a comprehensive policy data base and providing policy analysis and assessment, alternative evaluations and area expertise, the Foundation becomes the base from which the councils can work. It is the councils upon their own initiative or in response to requests from the President, Congress or the Directors that would take the lead in investigating and deliberating on long term and basic national policy. The councils would redefine problems, hold public forums, assess alternatives and suggest policy options. It is the councils' voices that would be heard through the policy papers submitted to Congress and the President and which would carry the weight of a "public consensus."

MANAGEMENT OF THE FOUNDATION

The Foundation would have a Director, a Deputy Director and nine Assistant Directors—one for each branch. It would also have a National Policy and Technology Board.

National Policy and Technology Board.—The Board would have 24 members and the Director. Specific responsibilities would include establishing Foundation policy, budget and program review, grant approval and biannual reports to the President for submission to Congress of the important national policy issues, emerging problems and opportunities along with the Foundation's recommendations for such policy legislation as may be deemed appropriate. Members would be Presidential appointees and would be selected from people prominent in a wide variety of fields including the professions, labor, entrepreneurship, management, education, industry, government, technology and trade. To avoid dominance by the Federal Government, the Board would be expected to independently represent all segments of society. Nominations for the Board should be widely solicited including from the Board itself, the national academies, professional societies, business associations, labor associations and other appropriate organizations. Board members would be appointed for 6 year terms. For continuity terms would be staggered.

The intent of the Board along with the councils is to insure that the community of those affected by National Policy will have a say in the operation of the Foundation and the creation of a national consensus for the resulting national policy recommendations.

Director and Assistant Directors.—The Director, the Deputy Director and the nine Assistant Directors of the Foundation would be Presidential appointees at executive levels II, III and IV respectively. The Directors' term of appointment would be 6 years.

In order to permit the strong central operation needed to coordinate activities of the various branches of the Foundation, all authority over the Foundation, other than that reserved to the Board has been given to the Director. The Director may delegate parts of that authority and would be expected to do so, but would always have the ability to take personal control of any aspect of the Foundation operations.

FOUNDATION OPERATION—POLICY FACILITATION

Facilitating the creation and where appropriate the implementation of coherent national policy in the long term public interest is the basic need to be satisfied by the National Policy and Technology Foundation.

The National Information Office would collect, organize and disseminate international and national information, data and statistics for public-private policy makers.

The Office of Policy, Analysis and Assessment would continuously evaluate data from the National Information Office to identify pending national needs, opportunities or problems. Alternative policy options would be proposed, evaluated and assessed by the Policy Office for consideration by the councils.

Independent public councils utilizing the data, evaluations and assessments of the Policy Office and other sources would respond to requests from the President, Congress, Foundation Directors or upon their own initiative. Councils would provide public forums that openly debate and redefine national policy issues and thus generate the public consensus necessary to avoid legislative grid lock.

With public recognition and acceptance of the equity of the tradeoffs and sacrifices inherent in resolution of any large scale public issue, the Congress and the President would have renewed flexibility to create and legislate consistent integrated national policy in the public interest. Responsibility for the implementation of designated sectors of these policies would be assigned by Congress to appropriate agencies. These could include activities which would be brought together in the Foundation from uncertain homes in bureaus scattered throughout the Federal Government.

Advancement of the Nation's civilian technological and professional capabilities would be offered by the Office of National Programs, the Office of the Professions, and the National Bureau of Standards. Emphasis would be upon facilitating policies and programs of substantial national interest where sufficient timely development cannot be expected from the private sector alone due to high risk, long lead time or the sheer magnitude of the required resources.

The Office of Institutional and Human Resource Development would be responsible for technology and professions institutional and human resource development. Stressing public-private cooperation, emphasis would be placed upon the long-term development of human resources and the creation of generic technology useful for many industries.

The United States still leads the world in basic research and technological innovation. However, we too frequently fall behind other nations which have more successfully deployed and utilized technology and systems often originated in the United States. Improving technology transfer and deployment in the United States would be an important responsibility of the Office of Small Business, the Office of Intergovernmental Technology and Professional Delivery Systems and the Patent and Trademark Office.

COORDINATION OF PROGRAMS

A separate section of the National Policy and Technology Foundation Act, section 12, requires close coordination of the Foundation's programs with other programs of the Federal Government, with the private sector and with State and local government programs.

A standing National Foundation Coordinating Board with five members each from the Boards of the National Policy and Technology Foundation, the National Foundation on the Arts and Humanities and the National Science Foundation would be appointed to provide recommendations to improve the collective effectiveness of the three Foundations in the national interest. To the greatest extent feasible, extramural basic research fields which the Foundation wishes to advance should be channeled through the National Science Foundation. Studies in societal value systems and ethics needed to support regulatory cost/benefit analyses would be coordinated with the applied humanities programs of the National Foundation on the Arts and Humanities.

Section 12 also requires that the Policy and Technology Foundation coordinate its small business activities with those of the Small Business Administration. Other coordination is required in other sections of the act. The National Information Office in cooperation with public and private agencies would seek to develop a coherent National Information and Statistics Policy that would lead to the development of readily accessed, comprehensive, computerized National Information and Statistics Data Banks. The Office of Policy, Analysis and Assessment is specifically charged with cooperating and coodinating with other policy bodies of Federal, State and local governments. The Federal Technology and Professions Extension Service is required to coordinate with existing programs such as State Technology Services to avoid duplication or adverse impact. Assistance would be provided to the President's Office of Science and Technology Policy and Analysis.

AUTHORIZATIONS

The act would provide for authorization of activities in fiscal year 1986. Any funds for years beyond 1986 would have to be authorized by future acts. We estimate that the fiscal year 1987 funding for the existing functions proposed to be transferred to the Foundation is about $500 million. We believe that a realistic level of funding for the first full year of operation of the Foundation should be about 20 percent more, or about $600 million. The precise level of authorization would be determined after hearings and a more precise determination of the final makeup of the Foundation.

While $600 million is a substantial expenditure, it represents less than 20 percent of the annual budget of Japan's MITI [Ministry of International Trade and Industry] which is that nation's leading instrument for facilitating national policy. The proposed budget also is substantially less than that of MITI's Agency of Industrial Science and Technology which includes the Japanese equivalent of the U.S. Bureau of Standards.

The success of our trade competitors in coordinating their national policies and advancing their technological competence to secure increased market share can be attributed to their creation and funding of competent national policy instruments.

SUMMARY

The concept of a National Policy and Technology Foundation grows from recognition of the limitations and resulting failures of the present national policy process. There is a clear need to correct the structural shortcomings of national policy institutions that have led to Gramm-Rudman. There is a need to provide the Congress with an effective nonpartisan mechanism for the creation and facilitation of consistent national policy. To satisfy the foregoing need, the Foundation would offer a comprehensive policy data base, policy alternative analysis and assessment, public policy review and consensus and finally—where appropriate—agencies to implement policy and supporting civilian technology.

The National Policy and Technology Foundation would be an independent agency with associated public councils and nine main branches for national information, policy analysis and assessment, national problem focused programs, the professions including engineering, institutional and human resource development, small business, intergovernmental technology and professions delivery systems, the National Bureau of Standards, and the Patent and Trademark Office. The agency would have programs transferred from NSF—almost all of engineering and applied science—and from the Department of Commerce—almost all of the programs of the Assistant Secretary of Commerce for Science and Technology. Responsibility for the centers for industrial technology would reside in the institutional and human resource development branch.

Governance for the Foundation would be handled by a Director and a National Policy and Technology Board patterned in organization but not composition after the National Science Board. Key functions of the Board would be to establish the policies of the Foundation and review the Foundation's budget and programs. The Director would have all powers not assigned to the Board and would be assisted by a deputy and nine assistants, one for each branch.

The bill contains authorization for fiscal year 1986 of $600 million with a line item for each of the nine branches. Additional authorizations will be required for succeeding years. It is expected that the economics to be realized from the Foundation will more than make up for the appropriations required above that presently budgeted for the existing agencies and activities that will be incorporated into the Foundation.

The bill requires close cooperation between the National Policy and Technology Foundation, the agencies and the private sector. A national Foundation Coordinating Board with equal membership from the Boards of the three National Foundations—Policy and Technology, Science, and Arts and Humanities, shall provide recommendations to improve the collective effectiveness of the three Foundations in the national interest.

Resume

Allen B. Rosenstein

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Creating the American Rules by Agencies of Alphabet Soup

Los Angeles Times

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By Mickey Kaus

WASHINGTON

A self-important youth who clerks for a Supreme Court Justice boasted to me the other day that the court has already ruled on the constitutionality of the Gramm-Rudman-Hollings deficit-reduction law. If I were sharp, I could take this inside information and make a fortune on the stock market, even though he didn't tell me what the ruling was. Wall Street brokers hang on any hint of the court's decision because of its enormous potential effect on the economy.

The Washington political community awaits the decision for a different reason: its enormous potential effect on the way the country is governed. This is hard for the average citizen to comprehend—all this mumbling about the "separation of powers" and some strange official called the comptroller general. We're used to reporters hyping court decisions as "landmarks." But believe it this time. Gramm-Rudman could easily be one of the two or three most important Supreme Court decisions of this century.

To understand why, it's best to start at the beginning, with the Founding Fathers. We all learned in civics class how they tried to prevent majority tyranny by establishing a complicated system of "separated" and balanced powers. The executive branch was separated from the legislative branch which was itself divided (into House and Senate). Each institution was democratically chosen, but in a different manner—and before a law could take effect, all three had to agree.

This system prevented the government from oppressing the people by the simple expedient of making it difficult for the government to agree to do anything at all. It worked, more or less, until the New Deal, when we discovered there was a lot more governing to do than the Fathers had anticipated. There were whole industries to regulate, prices to set, stockholders to protect. And there was seemingly no way everyone could agree on all the needed rules. So Congress created an "alphabet soup" of administrative agencies, in the words of Sam Rayburn, to "do what we don't have time to do."

Agencies like the Federal Trade Commission and the Securities and Exchange Commission write rules that have to be obeyed just as laws do. But those laws are never passed by Congress nor written by the President. Congress, leery of giving the President such powers, instead made most of the rule-making agencies "independent"—that is, the President could appoint the agencies' leaders but only fire them for "inefficiency" or "malfeasance," provable in court. The idea was that rule-makers would be experts, "bred to the facts" rather than politics.

Thus was born the "headless fourth branch of government": the administrative state. Independent agencies were an excrescence on the Constitution, ruled by unelected bureaucrats, accountable to neither President nor Congress. But they seemed to be what the times required. In a case called Humphrey's Executor, the Supreme Court (the other "separated" government branch) approved the idea that there were agency officials the President couldn't fire except "for cause."

But nobody was very comfortable with this arrangement. In 1946, Congress tried to limit the discretion of the agencies by subjecting their rulings to "judicial review." This only made things worse. Now, instead of rules just being written by unelected bureaucrats, they were then second-guessed by unelected judges. The lengthy and legalistic process by which rules are written, reviewed, revoked and rewritten—it takes a minimum of two years to produce a simple auto safety standard—is a central horror of contemporary Washington, as well as a primary source of income for its lawyers.

Meanwhile, Congress itself grew even more inefficient than it had been in the days when it "didn't have time" to write rules. Party discipline evaporated. Committees proliferated. Even if Congress could get its act together, the separation of powers still made a stalemate with the executive branch likely.

Gramm-Rudman is the product of such a stalemate. It is a sign that the Founding Fathers scheme not only can't produce the regulations necessary in a modern government, it can no longer even produce the budget necessary for any government. Congress wanted to cut defense spending and raise revenues. The President wanted to cut social spending. Instead of compromising—there being no constitutional mechanism that forces a compromise—they decided to create a sort of doomsday machine. If they couldn't agree by a certain date, all agency budgets (with major exceptions) would be cut across the board by an amount necessary to end the deficit. But who would decide what that amount was? Neither branch of government trusted the other. So the final decision was given to the comptroller general, an obscure official (he heads the General Accounting Office) who is "independent" because he may be removed only by two-thirds vote of Congress, with the concurrence of the President.

This bizarre "let-GAO-do-it" setup may be effective, but it obviously isn't what the Fathers had in mind. So ruled a three-judge federal appeals court, in an unsigned opinion apparently written by Antonin Scalia, a Reagan appointee. Congress could "delegate" the power to decide on the size of the budget cuts, the decision said. However it could only delegate it to an executive branch official, not to somebody (the comptroller general) who can't be fired by the President. Although conservatives have tried to paint the decision as a much-needed expansion of presidential power against an aggrandizing Congress, the opinion isn't really about the balance of power between the branches at all. It is about democratic accountability. Congress needn't, under this opinion, give the President the power to do anything. It can keep that power for itself. But if it does delegate the power, that person must be an official accountable to the only other elected branch of government, namely the executive.

But wait a minute. What about those "independent" agencies? They can't be controlled by the President either—or by Congress for that matter. If Gramm-Rudman isn't constitutional, then the alphabet soup of agencies doesn't look so constitutional either. Scalia and company did their best to encourage this conclusion, heaping scorn on Humphrey's Executor and, in a much quoted passage, declaring it not "obvious" that "there can be such things as genuinely 'independent' regulatory agencies." Which is why the case is such a big deal. It threatens to throw out, not only the budget-balancing law, but also the FTC, the SEC, the Federal Reserve, the Federal Communications Commission, the Interstate Commerce Commission, the Occupational Health and Safety . . . you get the picture. Much of government as we know it would go down the drain.

This might not be a bad thing. If Congress could delegate its power only to the President, it might be reluctant to delegate its power to anybody. That means it would have to pass regulations itself, like it passes ordinary laws, making the tough decisions and taking the political heat. If it wanted to pass the buck, it could only pass it to the President, and *he* would then be accountable to the voters. All nice and neat, the way the framers of the Constitution intended.

Unfortunately, the reason we got into this whole mess is that the framers' nice, neat scheme didn't work—or at least it didn't work efficiently enough to do the amount of governing we now have to do. Imagine the House and Senate, which take two months to debate a single arms sale to Saudi Arabia, trying to negotiate among themselves, and then with the President, on the thousands of regulations issued each year—even by this Administration. Congress couldn't conceivably do the job without an unprecedented degree of party discipline and a radically streamlined committee system.

If the Supreme Court throws out Gramm-Rudman on sweeping, Scalia-like grounds, Congress may have to experiment with such dangerous notions. But working within the Constitution's rusty machinery would probably require a dramatic reduction in the amount of government regulation.

The betting in Washington is that this won't happen. The court will chicken out and invalidate Gramm-Rudman on narrow grounds that don't threaten the rest of America's regulatory apparatus. If that happens, Gramm-Rudman will go down in history as just another futile attempt to escape the constitutional straitjacket bequeathed to us by the Founding Fathers. □

Mickey Kaus is a correspondent for the New Republic.

Mr. BOEHLERT [presiding]. Thank you very much, Doctor.

Mr. Brown will be returning shortly, and I have to go to the floor shortly to manage a bill, but I have a couple of questions I would like to start with.

Professor Lodge, I am convinced that more than anything we have an attitudinal problem, and you addressed that in your testimony. You talked about the Japanese being more concerned with long-range market share than they are with short-term profits, and it is just the reverse over here, it seems to me.

But we also have—and I am sorry that Mr. Samuel had to leave, but he is scheduled to appear before the Ways and Means Committee to testify, and that is important, too—I am also concerned with labor-management relations here, not only the difference in attitude between the Japanese and the United States in terms of market share versus short-term profits, but it seems in labor-management relations—and maybe we are witness to a change now—but there seems to be more of an interest in immediate gains in pay and benefits than there is in job security and the promise of growth in the future.

What do we do to have an attitudinal change in this country?

Professor LODGE. Congressman, I think you are absolutely right. Among the fundamental assumptions that have to be changed, as I suggest in my statement, are notions about management authority and relationships with the managed, and notions about the role of a trade union which are deep in our history.

First of all, the old idea was that the primary purpose of a business and its management was the satisfaction of shareholders. That may have made sense when shareholders were reasonably identifiable and when a manager could go and ask them: What do you want? Long-run market share or short-run returns quickly?

In most cases today, management can't talk to shareholders. Shareholders are represented by huge institutions, and the people who decide on what shareholders do are interested in very short-term results, so that the old idea has to change, and management is slowly changing to realize that the long-run health of the corporation requires an approach to finance which is different from the old.

The old idea was that if managers satisfied shareholders and competed in the marketplace, they had the right to hire and fire workers at will. And that, of course, results in fairly low levels of commitment by workers. Why should I tighten my belt to pay for competitive gains and commit myself to the long-run interests of the corporation if I am going to be fired next week?

So that is changing, and we are realizing that for a company to be competitive, its employees have to be committed to its health; and that requires some degree of employment security.

The old idea was that a union's purpose was to bargain adversarially to get more for its members, just as management was trying to get more for shareholders. This led to an adversarial relationship which drove up costs, reduced commitment, reduced productivity, and reduced quality.

It is now clear that the role of a union must be to represent its workers in the governance of the corporation, in identification of the workers, of employees, with the long-run health of the corporation, because if there is no corporation, there are no jobs, there are no wages, there are no members.

This problem of changing the attitudes of managers, on the one hand, and unions, on the other, is, of course, difficult. We see it happening, however. We see it happening at General Motors. If you look at the Saturn agreement of General Motors, it is very much a movement in this direction on both the part of management and the United Automobile Workers.

If you look at the fascinating experience of Toyota in Fremont, CA, where they are managing a General Motors assembly division which had very bad adversarial relationships in the old days, you see Japanese managers learning and teaching CM and the UAW how to comanage, in effect.

So, this has to happen. It is going to happen. To an extent, I think it is happening.

Mr. BOEHLERT. Let me ask you this, Professor.

Absent any other change, don't you—well, I am loading the question—but this attitudinal change that we are now witnessing, don't you think that it is a significant advance and it is going to help immeasurably in terms of improving our international competitiveness?

Professor LODGE. Very definitely. However, by itself, it isn't enough. Just as the exchange rate, by itself, isn't enough. Just as the National Cooperative Research Act of 1984 which loosened the antitrust laws, isn't enough.

There are a lot of things going on when you add them up, but the problem is that our uncompetitiveness derives from a fundamentally uncompetitive system. It's a strategic problem, and if those events are not accompanied by others such as a tax policy that really encourages savings, really encourages investment, a set of policies that do not subsidize those sectors of the economy which are already insulated from competition at the expense of those who are exposed to it; in other words, if we do not think strategically about how everything bears on competitiveness, no one of these innovations is going to be sufficient.

We need more engineers. We now have, as you know, an acute shortage of people to man high technology companies. So, it all has to be looked at together, and that is something that we are not very good at doing, the way we are set up.

So that something needs to be done, I think, institutionally to equip us to do that. You take now the Commerce Department. I have been reading the reports of the Office of Competitive Assessment. There are some 500 people over there who are going through, industry by industry, documenting in a very professional way the deterioration of virtually every high technology industry in the United States.

This is good data. What do you do with it?

It should be a part of policy considerations across-the-board. I don't think it is. So that the problem that these changes that are occurring, firm by firm, here and there, are important. By themselves, they are inadequate.

Mr. BROWN [presiding]. Thank you, Mr. Boehlert, for filling in for me during an unavoidable absence.

Having missed some of the earlier questions while I was out, I may be repetitive or duplicative, and if so, please say so.

We are developing here in this hearing a fairly good consensus as to the complexity of the problem, the complexity of the solution, the need for an enlightened and integrated policy.

All of this is going to contribute to making some progress in this area, but it is not the hearing process, the enlightenment that we are receiving, is not going to bring about that coherent policy that could be brought about.

We are seeking to look at an institutional arrangement. Institutional arrangements are not the only way to achieve coherent policy. If either one of you gentlemen were President of the United States, for example—we might even hope that you were—you could use the tools that you already have, probably, to pursue an enlightened policy which would solve many of these difficulties. Is that correct?

Professor Lodge. Yes, I believe it is, sir. For example, the President could use the Office of the U.S. Trade Representative and the advisory councils which it has, which bring together industry and labor and Government, and which were used, I think, very effectively in the late seventies with respect to the negotiation of the trade agreement.

That could be a vehicle to do some of the things which this act proposes. So I think you are right. It requires putting competitiveness high on the agenda of national goals, and that is what has not happened.

Mr. Brown. As each of the sectors and portions of the complex, massive, and really very powerful of American economy begin to understand the overall problem and their relationship to it, obviously we would expect them to take necessary steps to eliminate barriers within their own sector or institution to seek to develop this cooperative understanding and cooperative strategy that I think has been emphasized here.

Let me ask you this: What has our enlightened, higher education system, and particularly the graduate schools of business, done to focus on this problem?

Perhaps we each need to look at what we need to do in our own environment. We are trying to see what the Congress can do. What can you do? And I say this in the light of frequent criticism often of the business schools that they have been sort of the fountain of this philosophy of short-term profitability, which is one of the problems that we now face.

Professor Lodge. Mr. Chairman, I think that is entirely true. I think that we have been late, like everyone else, to understand the full dimensions of the problem. We, at the Harvard Business School, have been working now for about 5 years as hard as we can to try to understand what it is and to reorganize our curriculum in the field of human resource management, of business-government in the international economy, and even slowly in the field of finance.

So, we are not, by any means, innocent. But——

Mr. Brown. But you are not also entirely culpable, you know. If we have a national ethos on which the vast bulk of our corporate shareholders share that demands this, a business school can't change that ethos overnight.

Professor LODGE. That's right.

Mr. BROWN. Or even perhaps in a reasonably long period of time.

Professor LODGE. That's right. But I think there is a lot that the academic community in general can do that it has not done. It has taken economists an awfully long time to understand what is going on.

Mr. BROWN. Well, I am trying to focus on the different roles here. Now, obviously, to take the academic sector, you would find it easier to modify your relationship to this problem if you were doing so within a framework with national leadership which gave some sort of—or helped to generate some sort of a consensus of what was going on. And as I see a large part of the merit of our proposed institutional arrangement, it has a consensus-producing mechanism with that.

Professor LODGE. Sir, I think that is a critically important part of it.

Two years ago, we had a 3-day colloquium at Harvard to consider the results of our research in this area. About 20 chief executive officers came, including John Young and Ruben Mettler, of TRW, who is one of the leaders in this area. Those 20 CEO's, I think, were in entire agreement with our definition of the problem. We made a presentation to the AFL-CIO, and some of its leaders. They were in entire agreement.

We couldn't find any real dispute. The problem was Government. I think there is a tremendous amount of consensus out there. It has not been organized; it has not been exploited, and it is very hard for those—for the others—to move as fast as they should move, and can move, and would like to move, if there isn't the political leadership.

Mr. BROWN. Well, I will finally just venture a philosophical observation, based on more than 30 years in government. There isn't all that much leadership in government. What we look for, also, is a national consensus which we can seize upon and become the leaders of, after it has gotten well underway, though we have a multiplicity of interacting parts here, and we each need to do a better job of helping that interaction to produce beneficial societal results that we need to have.

I am very frustrated frequently at the slowness of government to understand the need for it to exercise leadership. The problem, however, as most politicians perceive it, is that if they exercise leadership too soon, they are in a disadvantaged position politically.

Professor LODGE. If I may, sir, on that point, the degree of change that this all requires, you could say, can only come about if there is a clear recognition of crisis.

Mr. BROWN. Yes.

Professor LODGE. The difficulty is that the crisis is by no means clear. Many of the afflicted industries employ relatively few people. I have in my statement that the robot industry employs about 2,000 people.

The losses in the steel industry and the automobile industry essentially have already occurred—as in the textile industry—so that interest group pluralism isn't reliable as a way of doing what needs to be done.

The difficulty is, the crisis is being avoided now by virtue of our capacity to borrow. When the crisis comes, it is going to be much bigger and much more painful than it needs to be, and I guess the trick is, how do you make maximum use of minimum crisis for maximum change?

That is politically difficult.

Mr. **Brown**. That is a very wise statement.

Let me turn to another aspect of this, and perhaps Dr. Rosenstein would like to comment on this.

A recent article caught my attention dealing with the current situation in Japan and some of the emerging problems that they are having. For example, their vast superiority in terms of turning out numbers of engineers, now it seems they have produced a greater number of engineers than there is adequate opportunity for in the fairly rigid hierarchical institutional structure that they have over there.

The second problem: The national demographics are also creating certain problems with regard to the opportunity for advancement even for the nonengineers, for managerial personnel, leading to what this article said was something like 2 million of what they call window managers, that is, people who occupy jobs but don't do anything, but because they take care of their people, they keep them on the payroll.

That is a built-in efficiency, however, which will show up sooner or later.

Third problem: The Japanese have been insufficiently insensitive to the impact that their very great superiority, and the balance of trade resulting, has upon their customers, like China, for example. They are apparently not sufficiently willing to share the technology and have the Chinese benefit from the opportunity to progress, and they treat them merely as consumers, or as an economic entity, rather than being conscious of their need to advance.

I was struck by this when I heard the testimony from, I think it was the General Electric witness that we had yesterday, who pointed out that in their international operations, they were very sensitive to this problem and sought to involve the nationals of the country they were operating in, in sharing technology and developing their own capability.

Now, my perception is that the Japanese have the mechanisms to analyze, develop solutions, and move toward solutions of these problems, but they are broader problems than what we have been discussing.

Could you comment on that, Dr. Rosenstein.

Dr. **Rosenstein**. Well, of course, the Japanese are not 10 feet tall, and they have developed what I think is a superior policy system, but it is still run and executed by human beings. It has its own inertia. It probably makes its own mistakes. The fact that they are recognizing these problems and talking about them among themselves is indicative of the fact that the system does have rather good feedback within it, and I would expect that they will, by bringing these to the forefront and having extensive national discussions, begin to move to solutions.

The first two problems are ones that if we are successful, we will face. If we are unsuccessful, we won't have to worry about them, and that's the fact that advance nations are going to unman their factories. We are all aware of this. My statistics show that by the year 2000, manufacturing will begin to approach agriculture as an essential part of our economy, but not a significant source of employment.

If you take reasonable linear extrapolations, which are always dangerous, we will only have 8.3 percent of the working population in manufacturing at the year 2000.

Now, that is not a significant percentage of the population, but it's like food; it's a very critical activity, and if we don't maintain that activity, it's easy to demonstrate that the standard of living will go down.

The question that we are going to have to face is, what will we do with the people who are now in manufacturing? How will they be gainfully employed? If we are successful, this will be the most critical, I think, single question that our society will have to face. We can do it—well, the Romans faced it, and they organized games—but I am not sure the supply of lions is adequate for that these days. We will have to find something more effective than that.

I have great confidence in man's ability to think of new ways to serve himself. If we do it well, the arts will flourish; man will have better health services or intellectual pursuits; and we could have that better life if we have a policy mechanism which will enable us to enjoy it.

Mr. **Brown**. Well, I appreciate that. That is the great merit of developing the policy leadership role that the legislation, of course, proposes. It can help us to anticipate those, and I am really bringing this up as an example of the kinds of policy issues that will need to be answered.

We face those today, this very day, in some sectors of the economy. Agriculture is a classic example. Historically, one of our most productive sectors is going to become even more productive, and the process will have to eliminate from the agricultural sector possibly 50 percent of those who are now in it because of increased productivity.

This is a political crisis because of the residual political power of the agricultural community in this country, and this is stemming from technological advances in biotechnology, for example. The dairy industry will be hugely impacted with the marketing of new synthetic growth hormones.

The mechanism to solve these problems is not in place. It is not in place in the Agriculture Department. It is not in place in the executive branch, in any location.

Dr. **Rosenstein**. These problems are inevitable. Mr. Samuel talked about a development in the garment industry. He talked about the U.S. garment industry coming together and, I think, raising $8 million to develop advanced machinery, and he alluded to the fact that Japan had a program which was financed at $60 million.

Well, that is the unmanned garment factory, and it turns out that Sweden has had a program which is now approximately 8 years old, where they have put up $80 million to develop the unmanned garment factory of the future.

As an engineer, I can tell you they have a high probability of being successful. Now, when they are successful, this country is going to face some painful adjustments that we aren't prepared for. There are over 1 million garment workers in this country, and the probability is very high that most of them are going to become redundant if either the Japanese or the Swedish programs are successful.

We are going to have the questions of, what do we do to plan for the orderly transition of the industry, itself, and, even more difficult, what do you do with 1 million redundant garment workers? I am sure there are no plans. I doubt if anyone is even considering it.

Mr. **Brown**. At the present time, we have been concealing some of these very substantial changes in the work force because of the fact that we have had a rapidly expanding service sector, frequently a very low-paid type of job; the typical thing that is mentioned, they say, is the fast-food restaurant, or something like that.

The problem here is that we are going to automate these, too, before very long. The whole office economy is going to be automated. The information world is going to be automated, and we will have to face up to the problem of how do you make creative use of human talent in an increasingly automated society, and we are not developing the policy answers to this kind of a situation.

I think—I almost hope—that we will perceive this as a crisis in the near future, so that we will be moved to apply our talents to doing something about it. It was a war, a crisis of that sort, that caused the Japanese to make their changes. Sometimes a war, a depression, or something of that sort, is necessary to get our attention, you might say.

I want to conclude the hearing this morning, not because we have exhausted the subject, but because we have, I think, established a very good record for pursuing this.

It is our intention to consult with the other members of the subcommittee, all of whom are vitally interested in this, with regard to identifying a political strategy that we can use to do this. It may well be that we will try several different strategies, maybe taking a few small initiatives and trying to move them, selecting a larger set of initiatives to prepare some more groundwork for building public and administration support, and I hope we will be able to continue to call on you gentlemen for assistance and look forward to seeing you at that time.

When we are doing the Lord's work, as we sometimes say, it is not always appreciated, but we hope it will be successful. Thank you very much.

Professor **Lodge**. Thank you.

Dr. **Rosenstein**. Thank you.

[Whereupon, at 11:40 a.m., the subcommittee adjourned, to reconvene subject to the call of the Chair.]

APPENDIX

MYRON TRIBUS
90 CARLTON STREET
BROOKLINE, MA
02146

617 731 9653

25 June 1986

Congressman George Brown
U.S. House of Representatives
Rayburn Building
Washington, DC 20515

Dear George:

The proposal to establish a quality award should be amended in the following way:

Sec. 2, (a) (7):

Add a fourth paragraph (D) as follows:

> (D) providing specific guidance for companies that wish to learn how to manage for high quality by giving detailed information on how winning companies were able to change their corporate cultures and achieve eminence.

In Sec.2 (b) change the references from "quality control" to "quality management". The concept of "quality control" is too narrow.

In Sec. 13 (the new section), (b) change "quality control" to "quality management".

Sec. 13 (b) (3) should be altered (or another section added) as follows:

> (3) An enterprise to which an award is made shall be required to make public a document which describes what the company did to train its employees, to improve its systems and to improve its internal activities to provide better goods and services to its customers. This document should be designed to be helpful to other enterprises in improving their systems. In exchange for making public their "quality know-how" the enterprise may publicize its receipt of such award and use the award in advertising, but shall be ineligible to receive another such award for a period of 5 years.

Sec. 13, (d) (1) (C) contains an explanatory paragraph which should be altered along the following lines:

In applying the provisions of subparagrph (c) with respect to any enterprise, the Secretary shall rely upon an intensive evaluation by a competent board of examiners who shall review the evidence submitted by the company and through a plant visit verify the accuracy of the advances claimed. The examination should encompass all aspects of the company, including activities from new product development to after-sales service and maintenance. The award should be given only to organizations which demonstrate what has been called "Total Quality Control", "Company Wide Qaulity Control" or "Company Wide Quality Management" through training and involvement of all their personnel in quality improvement.

Sec. 13, (d) (2) should have an additional paragraph:

(3) The Secretary shall appoint a board of overseers for the award, consisting of five persons selected for their pre-eminence in the field of quality management. This board shall meet annually to review the work of the contractor and make such suggestions for the improvement of the award process as they deem necessary. The terms of the five board of overseers shall be staggered. After the first five members have been selected, they shall each year nominate a slate of persons (at least 3) from which the Secretary is to choose the next member of the board. The board shall report the results of the award activities to the Secretary each year, along with their recommendations for improvement of the process.

My experience in the quality field suggests that it is unwise to entrust the handling of this award to any one group, especially not to one large organization such as one of our professional societies. The ASQC is well qualified to do the work, but the activities they pursue should be overseen.

I hope these remarks are helpful.

Very truly yours,

Myron Tribus

c: James H. Turner, Jr.

LEF904

HLC

99TH CONGRESS
2D SESSION

H. R. ____

IN THE HOUSE OF REPRESENTATIVES

Mr. ______________ introduced the following bill; which was referred to the Committee on ________________________

A BILL

To amend the Stevenson-Wydler Technology Innovation Act of 1980 to establish a National Quality Award, with the objective of encouraging American business and industrial enterprises to practice effective quality control in the provision of their goods and services.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the ``National Quality Award Act of 1986''.

SEC. 2. FINDINGS AND PURPOSES.

(a) FINDINGS.--The Congress finds and declares that--

(1) American business and industry are beginning to understand that improved quality of goods and services goes hand in hand with improved productivity, and that a commitment to excellence in manufacturing and services is becoming more and more essential to the well-being of our nation's economy and society;

(2) the leadership of the United States in product and process quality has been challenged strongly (and sometimes successfully) by foreign competition, and our nation's productivity growth has decreased over the last two decades while that of economically competing nations has increased;

(3) failure to alter this trend will lead to a lower standard of living and less opportunity for all Americans;

(4) although several other factors may have contributed, the year 1985 saw Japan becoming the world's top creditor nation while the United States became a net debtor nation for the first time;

(5) in Japan, the Union of Japanese Scientists and

Engineers sponsors a national quality award--the Deming Prize--which provides a powerful incentive to Japanese companies to promote quality improvement;

(6) the concept of quality improvement is directly applicable to manufacturing as well as service industries, to private enterprise as well as the public sector, and to large companies as well as small; and

(7) a national quality award of this kind in the United States would help improve quality and productivity by--

(A) helping to stimulate American companies to improve quality and productivity for the pride of recognition while obtaining a competitive edge through increased profits,

(B) recognizing the achievements of those companies which improve the quality of their goods and services and providing an example to others, and

(C) establishing guidelines and criteria that can be used by business, industrial, governmental, and other enterprises in evaluating their own quality improvement efforts.

(b) PURPOSE.--It is the purpose of this Act to provide for the establishment and conduct of a national quality improvement program under which awards are given to selected individuals, companies, and other enterprises in the United

States that practice effective quality control and as a result make significant improvements in the quality of their goods and services.

SEC. 3. ESTABLISHMENT OF NATIONAL QUALITY AWARD PROGRAM.

(a) IN GENERAL.--The Stevenson-Wydler Technology Innovation Act of 1980 is amended by redesignating sections 13, 14, and 15 as sections 14, 15, and 16, respectively, and by inserting after section 12 the following new section:

``**SEC. 13. NATIONAL QUALITY AWARD.**

``(a) ESTABLISHMENT.--There is hereby established a National Quality Award, which shall be evidenced by a medal of such design and materials and bearing such inscriptions as the President, on the basis of recommendations submitted by the Office of Science and Technology Policy, may prescribe.

``(b) MAKING AND PRESENTATION OF AWARD.--(1) The President shall periodically make the award, on the basis of recommendations received from the Secretary, to individuals, companies, and other enterprises which in his judgment have substantially benefitted the economic or social well-being of the United States through improvements in the quality of their goods or services resulting from the effective practice of quality control, and which as a consequence are deserving of special recognition.

``(2) The presentation of the award shall be made by the President with such ceremonies as he may deem proper.

``(3) An enterprise to which an award is made under this section may publicize its receipt of such award and use the award in its advertising, but shall be ineligible to receive another such award for a period of 5 years.

``(c) CATEGORIES IN WHICH AWARD MAY BE GIVEN.--(1) Subject to paragraph (2), separate awards shall be made to qualifying enterprises in each of the following categories:

``(A) Individuals.

``(B) Large manufacturing companies.

``(C) Other large companies.

``(D) Small manufacturing companies.

``(E) Other small companies.

``(F) Discrete divisions of large companies.

``(G) Nonprofit organizations.

``(2) The Secretary may at any time expand or otherwise modify the list of categories within which awards may be made, as initially in effect under paragraph (1), upon a determination that the objectives of this section would be better served by such expansion or modification.

``(3) Not more than two awards may be made within any category in any year (and no award shall be made within any category if there are no qualifying enterprises in that category).

``(d) CRITERIA FOR QUALIFICATION.--(1) An enterprise may qualify for an award under this section only if it--

``(A) applies to the Secretary in writing for the award,

``(B) cooperates with the Secretary in a rigorous evaluation of the way in which its business and other operations are conducted, and

``(C) meets such requirements and specifications as the Secretary determines to be appropriate to achieve the objectives of this section.

In applying the provisions of subparagraph (C) with respect to any enterprise, the Secretary shall take into account the corporate or other official policy of such enterprise with respect to quality improvement, its quality control system and management and the methods by which such is implemented, the education and training offered to its personnel with respect to quality improvement, the results of its quality control system, and its future goals.

``(2) The Secretary may, under appropriate contractual arrangements, carry out his responsibilities under subparagraphs (A) and (B) of paragraph (1) through the American Society for Quality Control or through one or more other appropriate entities.

``(e) FUNDING.--The Secretary is authorized to seek and accept gifts from public and private sources to carry out the program under this section. If additional sums are needed to cover the full cost of the program, the Secretary shall impose fees upon the enterprises applying for the award in amounts sufficient to provide such additional sums.''.

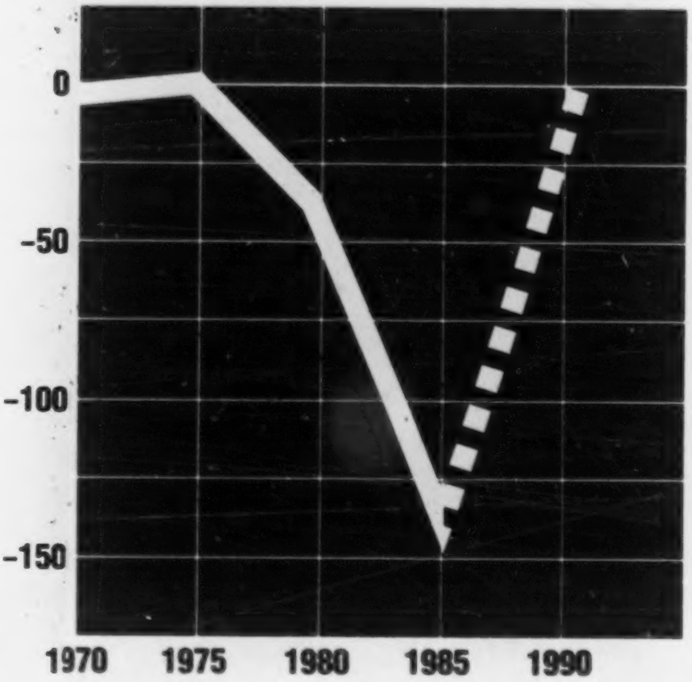
(b) CONFORMING AMENDMENTS.--(1) Section 5(d) of such Act is amended by striking ``and 13'' and insert ``and 14''.

(2) Section 9(d) of such Act is amended by striking ``or 13'' and inserting ``or 14''.

U.S. Trade Balance at a Turning Point:

Can We Eliminate the Trade Deficit by 1990?

U.S. Trade Balance



U.S. Trade Balance at a Turning Point:

Can We Eliminate the Trade Deficit by 1990?

NAM

June 1986
International Economic Affairs Department

It is easier to lose market share than to regain it. In 1985 the United States had an astonishing trade deficit of $150 billion. The deficit in manufactured goods was equal to three-quarters of the total, in contrast with a $5 billion surplus in manufactures in 1981. Our exports have still not regained their 1981 level, while imports have expanded on an unprecedented scale, whether measured in dollar value or market penetration. As a consequence, our total current account deficit has been over $100 billion for each of the past two years. Unless there is a major sustained improvement in the trade balance, the current account deficit will continue at this level for the foreseeable future, increasing the total foreign indebtedness of the United States at an alarming rate.

Every business faced with declining market share and tougher competition needs to develop a new plan with clear operational goals, and this is equally true of our nation as a whole. The present administration has inaugurated a cooperative policy with other major industrial countries aimed at reducing the U.S. dollar exchange rate, and this is an indispensable first step in any attack on the trade deficit problem. This report sets a longer range goal, by asking how we could eliminate the U.S. trade deficit by 1990. We seek to achieve this goal without resorting to protectionist measures and without undermining the fragile recoveries of many foreign economies that have come to rely on exports to the U.S. market. Our comments on possible changes in both sectoral and geographical trade balances are meant to be suggestive. We don't pretend to provide all the answers, but we want to promote a debate on the necessary strategies and goals for a national trade policy.

Regaining market share is industry's challenge. To help create the conditions in which this might take place is a shared responsibility of government and industry. Establishing a climate for growth and competitiveness calls for actions as diverse as reducing the federal budget deficit, increasing capital formation, expanding research and development and increasing productivity. These actions cannot be accomplished, however, absent a national commitment to a priority for trade and competitiveness. Nothing less than the maintenance of our present standard of living is at stake.

Alexander Trowbridge
President
National Association of Manufacturers

Contents

Executive Summary 1

I. **U.S. Manufacturing and the Trade Deficit** 3
The Overall U.S. Balance of Payments 3
The Manufactures Deficit Determines the Total Trade Deficit 4
A Crisis in Our Most Competitive Industries 5
Can We Achieve a Zero Trade Deficit in Manufactures? 9

II. **Impact of the U.S. Trade Deficit: Home and Abroad** 11
Effect on the U.S. Economy 11
Effect on Foreign Economies 11
Can We Achieve a Zero Trade Deficit Without Destabilizing World Growth? 13

III. **A Blueprint for U.S. Trade Strategy** 17
Exchange Rate Policy 17
U.S. Policy Changes for the Short Term 18
Long-Term Policy Changes 19
Final Comment 21

Illustrations

Figure 1A. Major Factors in U.S. Balance of Payments, 1975-1985 3
Figure 1B. Annual U.S. Trade Balances 4
Figure 1C. Major Sectoral Balances in U.S. Trade, 1981 and 1985 4
Figure 1D. Shares of U.S. Exports and Imports by Major Product Sectors, 1981 and 1985 5
Figure 1E. Trade Balances in Manufactured Goods 5
Figure 1F. Major Sectoral Balances in U.S. Manufactures Trade 6
Figure 1G. U.S. Manufactures Trade—Major Product Categories, 1981-1985 7
Figure 1H. Ratio of U.S. Trade to Production and Consumption: Selected Manufactured Goods Categories, 1972-1985 8
Figure 1I. 1990 "Zero Deficit" Trade Balance—Major Economic Sectors 9
Figure 1J. 1990 "Zero Deficit" Trade Balance—Major Manufactured Goods Categories 9

Figure 2A. U.S. Trade Balances with Major Trading Partners 12
Figure 2B. Exports to U.S. as Share of Growth in Major Trading Partners, 1981-1985 13
Figure 2C. 1990 "Zero Deficit" Trade Balance—Major Trading Partners 14
Figure 2D. Latin American Trade Balance Adjustment, 1981-1985 15

Figure 3A. Dollar Exchange Rate—Major Industrial Countries 17
Figure 3B. Currency Exchange Rates—Newly Industrializing Countries 18

Appendix 1. U.S. Trade Balances—Manufactures and Total Trade, 1970-1985 22
Appendix 2. U.S. Trade with Major Regional Trading Partners, 1981-1985 22

U.S. Trade at a Turning Point: Can We Eliminate the Trade Deficit by 1990?

Executive Summary

This report is a sequel to NAM's report of August 1985 on the U.S. trade deficit. It examines both the development of the deficit and how it can possibly be eliminated. Using revised statistical material, it shows how manufacturing has been the key to the worsening of the trade deficit and how the most critical problem has been in the most advanced and competitive sectors of our economy—namely, capital goods and high technology products. We indicate how a zero trade balance could be achieved principally through better manufactured goods export performance. But we also indicate that in achieving such a change we must consider the impact on the economies of our major trading partners. Finally, we provide a blueprint for necessary policy changes to enhance U.S. trade performance without resorting to major new protectionist measures. We suggest a goal of a zero trade balance by 1990.

U.S. Manufacturing and the Trade Deficit

The Federal Reserve Bank of New York has calculated that even under favorable circumstances U.S. foreign debt will approach $500 billion by 1990. This net debtor position will not begin to be reduced until the United States again achieves a surplus in the overall balance of payments on current account. As recently as 1981, positive balances in investment earnings and other services offset our trade deficit and produced an overall current account surplus. However, the accumulation of foreign debt and the present level of the trade deficit is so extraordinary that we probably cannot again achieve a current account surplus until we achieve a trade balance at or near zero.

Secretary of the Treasury Baker recently indicated that a lower dollar, cheaper imported oil and more favorable foreign growth trends could lower the trade deficit to about $100 billion in 1987. The overall current account deficit could fall to roughly the same level. But he also predicted renewed increases in these deficits again after 1987. His estimates emphasize the need for a comprehensive national strategy targeted on a reduction of the trade deficit if the runaway U.S. current account deficit is to be brought under control.

The worsening of the U.S. trade deficit since 1981 is principally due to the deterioration in the manufactured goods balance of almost $120 billion. A $27 billion fall in net oil imports since 1981 has more than offset a $20 billion decline in our agricultural surplus. Thus, our total trade deficit today would actually be less than in 1981 if there had been no change in the manufactures balance. Since manufactures account for more than two-thirds of both our exports and our imports of all goods, there is no way to reduce the present trade deficit substantially without a sustained improvement in manufactured goods trade.

Our manufactured goods trade position has worsened from a $5 billion surplus in 1981 to a $113 billion deficit in 1985, counting imports c.i.f. The major problem has been a crisis in some of our most competitive, high technology, export-oriented product areas.

Because of rising imports and flat exports, our capital goods surplus fell $37 billion by 1985 to only $9 billion (counting imports f.a.s. or at customs value). Our surplus in high-tech goods was only $5 billion compared to $27 billion in 1981. Meanwhile, our deficits in automotive and consumer goods expanded by more than $30 billion each for a total of $100 billion. In 1981, our capital goods exports were so strong we had a net $11 billion surplus in capital, consumer and automotive goods. By 1985, this had changed to a net $91 billion deficit. This swing—more than $100 billion—is enough to explain almost all the worsening of the trade deficit without even considering basic industries such as steel or textiles, which have long been troubled by imports and have also suffered trade losses in this period.

We could seek to reduce our manufactured goods trade deficit through a sharp reduction of imports—either through a deliberately protectionist policy or through a severe domestic economic recession. But we can also address the issue more positively by seeking to make our exports and import-competing industries more competitive. The elements of a zero deficit in manufactures by 1990 could be:

- Strengthened U.S. capital goods/high technology exports, buoyed by a lower dollar exchange rate, stronger domestic growth in other countries and improved market access for U.S. goods. Under favorable conditions, we could see a reexpansion of the trade surplus in these products by $50 billion by 1990.
- Reduction of the automotive goods trade deficit from $44 billion to $20 billion by 1990, chiefly through increased sourcing from domestic production facilities—especially by foreign-owned car makers.
- A minimal improvement ($5-$10 billion) in the trade deficit in other consumer goods.
- Achievement of a $10 billion surplus in non-oil industrial supplies and materials. The falling dollar should assist a recovery in our still-strong chemical industry to a surplus of $10 billion. Together with limited sector-specific policies, the weaker dollar should assist U.S. producers in other basic product groups where price plays a major role because of limited product differentiation. Total net change: $20 billion.

Impact of the Trade Deficit: Home and Abroad

The most striking impact has been on overall growth and employment levels. From mid-1984 through the end of 1985, the U.S. gross national product (GNP) grew at an annual rate of only 1.8 percent, compared to a hypothetical 3.0 percent if only there had been no further worsening of the already-high mid-1984 net deficit in U.S. total trade in goods and services. And recent Commerce Department estimates show that the net impact of trade on total U.S. employment since 1981 has been a loss of about 2 million jobs resulting in no net reduction in the unemployment rate over prerecession levels.

The continuing fall in interest rates, world oil prices and the exchange rate of the dollar could spark an increase in the U.S. growth rate in 1986. Whether such a growth rebound can be sustained over the longer term will be determined to a large extent by our success in effecting a strong and continuing positive trend in the trade account.

U.S. macroeconomic policies, which have led to strong net capital inflows, a rising dollar and massive U.S. trade deficits, have to some extent reduced foreign growth and encouraged economic policies subsequently based on increasing exports to the U.S. market. Whatever the cause, most foreign governments have relied heavily on a rapid improvement in their trade balance with the United States to stimulate growth or to pull out of a recession.

If we analyze the U.S. trade deficit on a geographical basis, we find that since 1981, U.S. exports have stagnated or fallen in every major market with the principal exception of Canada. Most of our trading partners, however, relied on increasing exports to the United States to provide a quarter to a half or more of their net growth since 1981. The U.S. trade deficit has thus worsened by more than $30 billion with both Japan and the European Community, by more than $20 billion with both Latin America and the developing East Asian economies, and by $15 billion with Canada. Only with the OPEC nations have we seen a major improvement in our net trade balance--$19 billion since 1981.

Can we achieve a zero trade deficit without endangering future world growth? For most of our trading partners, recovery from the recession of the early 1980s has only been weak or partial. Reduction of our own federal budget deficit and interest rates will assist in creating conditions conducive to more domestically oriented growth and investment in foreign economies. This would not only stimulate demand for U.S. exports of manufactured and agricultural goods, it would also create demand for third-country exports and reduce the disproportionate role played by the U.S. market in the continuing world economic recovery. The falling dollar could also make oil and other primary commodity imports more affordable for the advanced industrial countries while it makes dollar-denominated debt burden easier to bear for many Third World countries.

We estimate that the following levels of change could be made in U.S. bilateral or regional trade balances by 1990 without seriously destabilizing continued prospects of world economic recovery and growth:

- Japan. Reduction of U.S. deficit by $30 billion, from $50 billion to $20 billion.
- East Asia. Reduction of U.S. deficit by $18 billion, from $28 billion to $10 billion.
- European Community. Reduction of U.S. deficit by $17 billion, from $22 billion to $5 billion.
- Canada. Reduction of U.S. deficit by $12 billion, from $22 billion to $10 billion.
- Mexico and non-OPEC Latin America. Reduction of U.S. deficit by $13 billion, from $13 billion to zero.
- OPEC. Elimination of present $12 billion deficit.

The brunt of the change—almost $50 billion in total—falls on Japan and the East Asian economies. These countries have followed export-led growth strategies and have benefited from ready access to the U.S. market to support high domestic growth rates. Our strategy would require a greater focus in these economies on domestically generated growth, together with greater openness to imports from the United States and third country trade partners. But even total changes of this magnitude in our bilateral trade deficits would not eliminate the overall deficit entirely.

A Blueprint for U.S. Trade Strategy

The principal goal of U.S. trade strategy should be to reverse the widening trade deficit by improving the competitiveness of U.S. manufactured goods in home and export markets. Encouragement of growth-oriented policies in foreign economies and the recent fall in the dollar can help create improved market opportunities, but there is a long agenda of other specific policy actions and proposals that needs to be addressed if U.S. trade competitiveness is to be maximized. The major areas of concern are further development of U.S. exchange rate policies, short-term policy changes to improve U.S. trade prospects and longer-term reform aimed at improving overall competitiveness.

The fall in the dollar's exchange value through the coordinated action of the major industrial nations improves prospects of reducing the U.S. trade deficit. The reversal of the dollar's appreciation needs to be completed and consolidated through the following specific actions:

- Further and possibly substantial appreciation of the Japanese yen. The present exchange value of the yen still does not reflect the relative competitive position of Japan.
- Appreciation of the Canadian dollar and the currencies of the East Asian and Latin American NICs, which continued to fall against the dollar in 1985.
- International agreement on long-term reform of the international monetary system.

U.S. policy changes for the short-term:

- Reduction of the federal budget deficit, which has both stimulated U.S. imports and contributed to the rise in value of the dollar.
- Improved market access for U.S. exports through international trade negotiations.
- Consideration of special trade and domestic policy agreements to be negotiated with Japan.
- Creation of an official export strategy, including a revival of official export financing, reduction of export controls and enhanced promotion of small business exports. Such a coordinated export strategy should be under the direction of a single Cabinet-level department for international trade.
- Maintenance of existing trade arrangements, enforcement of existing laws against unfair trade practices and trade law reforms to provide an offset to competitive advantages gained by foreign producers in 1981-85 and to hold down further increases in U.S. trade deficits, especially in basic industries.

Long-term policy changes:

- Reducing the high cost of capital to U.S. manufacturers especially through federal budget deficit reduction and tax policy reform.
- Focusing on tax policy by rejecting the present House-passed reform bill, which will raise the cost of capital for U.S. manufacturers. Tax reform should be utilized to shift the tax burden more in the direction of consumption.
- Adopting a world market share standard as the basic antitrust guideline, rather than shares of the domestic market involved in proposed mergers.
- Reforming product liability laws, which will reduce the negative impact of increased insurance premiums on prices of U.S. exports and import-competing products.
- Reforming the GATT to include a wider range of government interventionist actions and nontariff barriers, foreign investment policies and other national trade-distorting practices.
- Developing national policies to improve U.S. competitiveness, not only in high technology, R&D-intensive industries, but also in more traditional capital-intensive industries, which provide a large customer base for high-tech capital goods products.

I. U.S. Manufacturing and the Trade Deficit

The $100 billion-plus worsening in the U.S. manufactured goods trade balance over a period of just four years is one of the profoundest changes in the international economy in the 20th century. In the 1970s, even when the manufactures trade balance slipped into deficit, as in 1972-73 and 1978, the absolute level of the deficit was not very great. And in each of these earlier cases, the United States quickly moved back into a surplus that helped pay our rising import bill and contributed to the recovery of an overall surplus in the balance of payments on current account.

Today, the manufactures trade deficit has become a persistent and, apparently, a semipermanent feature of the international economic landscape. It is the primary cause of a $100 billion-plus U.S. current account deficit that may persist into the foreseeable future. It is also a chronic drag on U.S. domestic growth and employment. And it is the number one reason that the United States, always a creditor nation in world financial markets since World War I, may this year become the world's leading net debtor country.

The Overall U.S. Balance of Payments

The balance of payments on current account, which includes the merchandise trade balance, summarizes the overall annual balance in U.S. international transactions. As we reported last year, there is no indication that areas in which the United States has traditionally reported surpluses can, to any substantial degree, offset the massive worsening of the merchandise trade deficit, which has been caused mainly by manufactures trade performance.

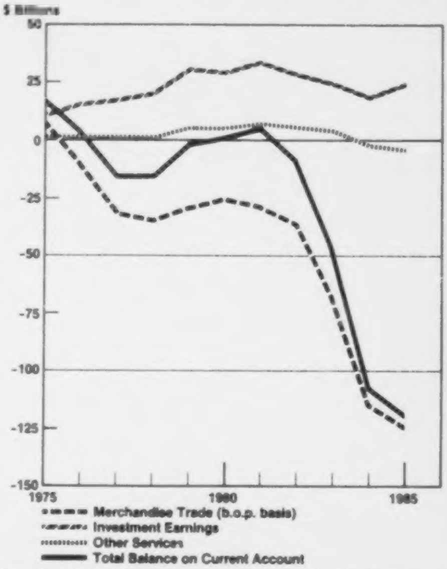
Figure 1A shows that the U.S. trade deficit calculated on the "balance of payments" basis widened from $28 billion in 1981 to $114 billion in 1984 and $124 billion in 1985. The overall balance of payments on current account followed a parallel course. From a $6 billion surplus in 1981, it fell to a $107 billion deficit in 1984 and a $118 billion deficit in 1985.

Net investment earnings have reversed a decline that had occurred since 1981 with an improvement of $6 billion in 1985 to a $25 billion U.S. surplus. But this change is far too small to have any major impact on the total current account deficit. And this improvement in investment earnings was partly offset by a $2.5 billion fall in net earnings on other services, to a deficit of more than $3 billion in 1985. Together with transfers and other payments, the nongoods trade side of the balance of payments only offset the trade deficit by $6 billion in 1985.

Each successive current account deficit adds to the national foreign debt position of the United States and increases the pressure for corrective adjustments. Gerald Corrigan, president of the New York Federal Reserve Bank, stated last September that, "...It is difficult to foresee circumstances in which the foreign debt of the United States would not approach $500 billion by the end of the decade." Corrigan then stated, "Servicing $500 billion in external debt at roughly current interest rates could produce a $35 to $45 billion gap between our trade and current account deficits and would imply that even approaching a current account balance will require not just a balancing of our trade account but moving the trade account into a sizeable surplus position."

Secretary of the Treasury James Baker noted in a recent meeting of OECD finance ministers that cheaper oil, a lower value of the dollar and improved foreign growth prospects would reduce the U.S. trade and current account deficits over the next two years. But, he continued, this would still leave 1987 trade and current account deficits in the $100 billion range that "is not politically sustainable" and both could actually widen again after 1987. Despite expectation of some short-term imporvements, the trade and current account deficit problem remains unresolved.

Figure 1A
Major Factors in U.S. Balance of Payments, 1975-1985



Source: Department of Commerce, *Survey of Current Business* and preliminary 1985 balance of payments statistics.

by increased capital account inflows. With falling interest rates, lower T-bill yields and poorer U.S. economic growth in 1985, the preliminary indications are that, like domestic investors, foreigners moved strongly into the stock and bond markets. New foreign investments in portfolio holdings of nongovernment securities soared from $13 billion in 1984 to $51 billion in 1985. Meanwhile, foreign direct investment inflows actually fell from $23 billion to $16 billion. Capital inflows into U.S. Treasury securities remained virtually unchanged at about $21 billion, and bank loan placements increased somewhat from $32 billion to $41 billion. And that disguised form of capital inflow, the "statistical discrepancy," was $32 billion, slightly higher than in 1984. Despite the fall in the dollar's value, new capital inflows remained strong in 1985. There is not yet any indication that international capital markets will "discipline" the United States for its current account deficit. But the longer this deficit accumulates, the more serious and difficult will be the process of readjustment. To quote from the president's 1986 *Annual Report on the Trade Agreements Pro-*

gram: "The United States has borrowed so much money from overseas to finance its deficits and domestic investment that it has become a net debtor to the world for the first time in 70 years....In effect, foreign money lets us live beyond our current means."

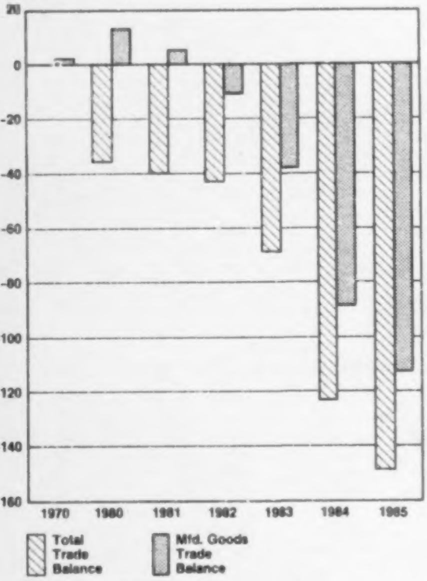
The Manufactures Deficit Determines the Total Trade Deficit

The U.S. trade deficit in 1985 reached $149 billion if we measure imports c.i.f., the most commonly used method. This represented the second consecutive year that the trade deficit exceeded $100 billion. Moreover, the 1985 trade deficit was more than $100 billion higher than our deficit of about $40 billion in 1981. The major cause of the present level of the trade deficit is the deterioration in manufactured goods. We will be unable to substantially reduce our overall trade deficit or current account deficit unless we can reverse this trend and move back toward a zero balance in manufactured goods.

The composition of the trade deficit is as significant as its absolute scale. As shown in *Figure 1B* and *Appendix 1*, the United States actually maintained a small manufactured goods surplus ($5 billion) as late as 1981. This remains the peak year for both total U.S. exports and exports of manufactured goods. Since then, the manufactured goods balance has worsened by $118 billion to a deficit of $113 billion last year. The deterioration in manufactures has, by itself, more than accounted for the overall fall in the trade balance. As shown in *Figure 1C*, the $17 billion decline in our agricultural surplus (from $25 billion to $8 billion in this period) has been more than compensated by the $27 billion fall in the net cost of imported oil (from $75 billion to $48 billion). The U.S. trade balance could have actually improved since 1981, if our manufactures balance had remained constant.

Figure 1B
Annual U.S. Trade Balances
Total Trade & Manufactured Goods

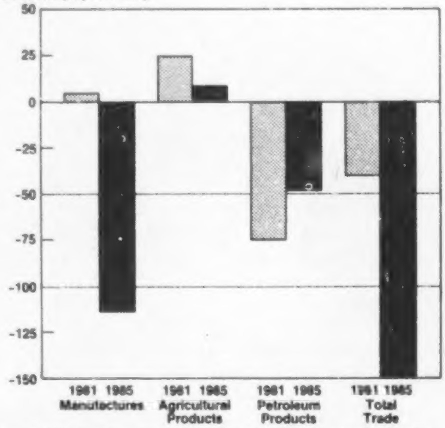
$ Billions (Imports c.i.f.)



Source: NAM, from Commerce Department data.

Figure 1C
Major Sectoral Balances in U.S. Trade, 1981 and 1985

$ Billions (Imports c.i.f.)



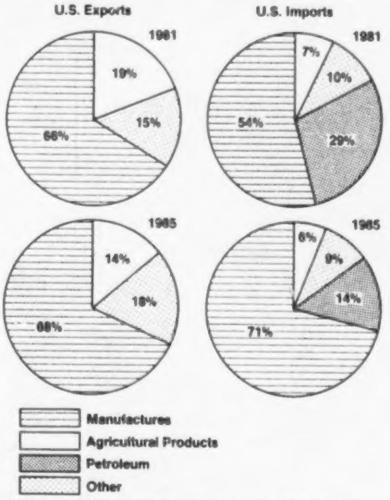
Source: NAM, from Commerce Department, *Highlights of U.S. Export and Import Trade.*

Despite this deterioration of unprecedented scale in our manufactures balance, and four years of non-growth in exports, manufactured goods remain the heart of our export economy. *Figure 1D* shows that despite the worsening of the manufactures balance, manufactured goods actually increased from 66 percent to 68 percent as a share of U.S. exports between 1981 and 1985. Agricultural goods fell from 19 percent to just 14 percent of our export total and all other goods remained at less than 20 percent. At the same time, manufactured goods increased much more rapidly as a share of imports—from 54 percent to 71 percent. Between 1981 and 1985, the dollar value of manufactured imports jumped 73 percent, from $149 billion to $258 billion, while exports fell by 6 percent.

Figure 1E shows how our manufactures trade balance now stacks up against our two leading competitors. Last year, the Japanese global surplus hit nearly $130 billion. Germany is much more open to imports than Japan and its key market, Europe, has been affected by low growth. But the Germans have nonetheless maintained surpluses at or above the $60 billion level in the 1980s. By contrast, the U.S. manufactured goods trade balance, never higher than $20 billion in surplus, plunged into deficit by $113 billion in 1985.

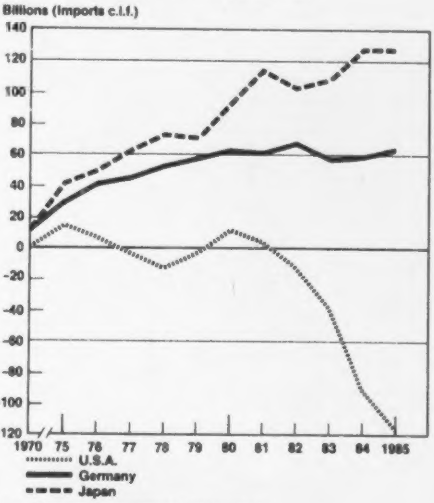
What is the cause of a U.S. trade deficit of this magnitude, and in particular the scale of the deficit in manufactures? Last year's NAM report covered this issue in some detail, but it would be useful to review this subject again briefly because of the policy implications and because of the additional perspective gained through analysis of more recent developments.

Figure 1D
Shares of U.S. Exports and Imports by Major Product Sectors, 1981 and 1985



Source: NAM, from data in Commerce Department, *Highlights of U.S. Export and Import Trade.*

Figure 1E
Trade Balances in Manufactured Goods



Japan and Germany: January-October 1985 at annual rate.

Sources: NAM, from Commerce Department, *Highlights of U.S. Export and Import Trade* and unpublished data; OECD, *Foreign Trade, Series C.*

The major proximate cause of the excessively large U.S. trade deficit is the failure of the dollar exchange rate to reflect the deficitary U.S. trade and current account trends that were caused initially by international differences in domestic growth cycles. An appreciation of the dollar during 1981-82 stimulated imports and counteracted the restrictive effects of a sharp recession on demand. Imports did not fall as they had in 1975, the last recessionary year of similar magnitude (*Appendix 1*). The rapid growth of the federal budget deficit stimulated both domestic demand and foreign capital inflows, which drove up the value of the dollar. A rapid rise of imports as seen in 1983-84 is normal in a period of strong economic recovery. The failure of the exchange rate to reflect the resulting trade deficit, however, is not normal. Moreover, the continuing tendency of the dollar to appreciate through early 1985 negated the positive cyclical trade effects we would normally expect during the later stages of a U.S. economic recovery. A falling currency, relatively slower domestic growth and increased demand abroad should provide an export boost to the later stages of the business cycle. This didn't happen.

Thus, 1985 export growth was negligible, and imports continued to rise, even if at a somewhat slower pace. In manufactures, for example, 1985 U.S. exports were up only 2 percent over 1984, despite stronger growth in most major export markets (such as Europe, Canada, Japan and even parts of Latin America). This was actually a much slower export recovery than the 1984 rate of 9 percent, and total exports remained lower than in 1981. Meanwhile, manufactured imports grew by 11 percent, added on to the 36 percent increase of 1984.

In recent testimony before Congress, Paul Krugman of the National Bureau of Economic Research estimated that fully 60 percent of the $100 billion-plus increase in the trade deficit was due to the perverse behavior of the exchange rate. He ascribed a further 20 percent to the growth cycle trends mentioned here and another 20 percent to the impact of the Third World debt crisis, a subject we will look at in the next chapter.

Of course, all three of these causes may be linked, and all are also related to the impact of the federal budget deficit and high real interest rates in the United States in 1981-85. It is significant that in seeking to deal with the trade problem, Secretary of the Treasury Baker and the Reagan administration last year identified the exchange rate as the number one problem that could be addressed through immediate coordinated international action. In the third chapter, we will look closely at the success of this effort to accelerate the fall in the dollar's exchange value. The possible achievement of a zero U.S. trade deficit must rest on the assumption that the dollar will fall further on exchange markets, as well as on positive growth trends in export markets.

A Crisis in Our Most Competitive Industries

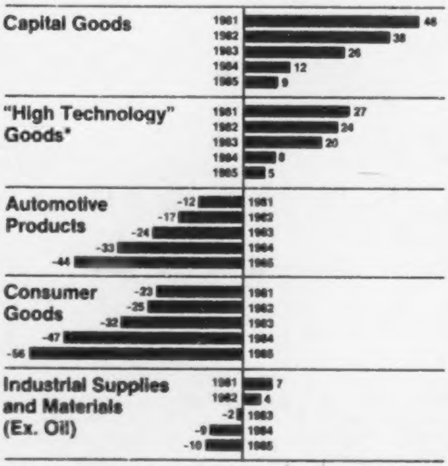
If we analyze the trade deficit by major "end use" sectors as in *Figure 1F*, we find that three large industrial product sectors have contributed about $30-40 billion each to the worsening of the trade deficit since 1981. While our capital goods surplus (including the high-tech balance) has nearly disappeared, the automotive and consumer deficits have each expanded by an equivalent amount. The statistical consequences are simple to comprehend: In 1981, a capital goods surplus of $46 billion (imports f.a.s.) comfortably covered a total automotive and consumer goods deficit of $35 billion. In 1985, the automotive and consumer goods deficits combined to total $100 billion, and less than

10 percent of this amount was offset by the surplus in capital goods. This is the heart of the U.S. trade deficit problem.

The *capital goods* surplus, which includes most of the U.S. export "winners," has actually taken the largest fall—by $37 billion—from a surplus of $46 billion to just $9 billion. The high-tech surplus, considered here as a subset of capital goods, fell proportionately by $22 billion. The much more publicized deficit in *automotive products* worsened from $12 billion in 1981 to $44 billion in 1985, for a net $32 billion decline. And the *consumer goods* deficit worsened by $33 billion, from $23 billion to $56 billion.

In industrial supplies and materials, there has actually been a net U.S. gain due to falling oil prices. If we exclude oil, however, as in *Figure 1F*, the total decline in this category was $17 billion, caused by a shift from a $7 billion U.S. surplus to a $10 billion deficit. This category includes chemicals where there is a strong, though declining, U.S. trade surplus, and such import-troubled basic industries as steel, nonferrous metals, textiles and lumber. While the $17 billion deterioration in nonpetroleum industrial materials is significant, it does not appear to be the core of the trade problem, as has been stated in some very important studies of the subject. Robert Lawrence of the Brookings Institution, for example, in his otherwise useful and comprehensive study *Can America Compete?* and the detailed analysis in the president's most recent annual trade report both stress that the trade deficit problem is related to long-term effects of "structural adjustment" in basic industries and some other traditional problem industries such as automobiles. This misses the significance of the fact that shrinking surpluses in our competitive high-tech industries are less and less able to cover deficits in industries where both foreign imports and overall demand are growing fast.

Figure 1F
Major Sectoral Balances in U.S. Manufactures Trade
$ Billions (Imports f.a.s. or customs value)



*High technology goods as defined by Commerce Department, definition no. 3.

Source: NAM, from Commerce Department, *Highlights of U.S. Export and Import Trade* and unpublished data.

Figure 1G allows us to analyze specific product developments from these categories in more detail. High-tech products show overall export gains since 1981, but imports have grown much faster. This includes computers (exports up 52 percent over the period) but also other high-tech-related products such as telecommunications equipment (exports up 8 percent); electrical machinery and parts, including semiconductors (exports up 9 percent); and instruments (exports up 8 percent). Despite U.S. export growth since 1981, faster growth in imports meant substantial declines in product category trade balances: computers, $3 billion; electrical machinery and parts, $7.5 billion; nonconsumer telecom equipment, $4.6 billion; instruments, $1.1 billion.

Another high-tech product, aircraft, showed a 32 percent jump in exports in 1985, which is typical of the volatile year-to-year changes in this category. However, 1985 aircraft exports were only 2 percent higher than in 1981 and the U.S. trade surplus was actually $1.3 billion less.

If we look at *Figure 1H*, we can see that the latest Commerce Department *Industry Outlook* estimates tend to show accelerated foreign import shares of domestic U.S. consumption for these and similar high-tech products and a relatively reduced or stagnant level of exports. In computers, for example, imports climbed from 7 percent of domestic consumption in 1981 to an estimated 18 percent in 1985, while exports stayed at 29 percent of production. In virtually all other cases, the export share of output shipments fell, sometimes dramatically. The most successful and competitive U.S. export industries have thus experienced both declining trade balances and often higher estimated rates of import penetration.

A second group of capital goods products is comprised of the more traditional industrial equipment and machinery, in which the United States had strong surpluses and high rates of export growth in 1977-81. As noted in last year's report, these U.S. product groups have been hit by a triple whammy: low foreign demand, low growth of domestic demand and increased foreign competition here and abroad based primarily on lower prices. Despite a 5 percent increase in 1985, for example, U.S. construction and special purpose machinery exports were still 24 percent lower than in 1981, while imports were 63 percent higher. For construction machinery alone, the *Industry Outlook* estimates a rise in import shares in the U.S. market from 9 to 16 percent over four years and a fall in exports as a share of shipments from 41 to 21 percent. Since 1981, our trade surplus in construction and special industrial machinery has fallen by more than $5 billion. In varying degrees, the same trends have affected most machinery industries. General industrial machinery and parts, for example, show a 36 percent decline in exports since 1981 and a 65 percent rise in imports. For machine tools, the fall in exports was 45 percent and the rise in imports 40 percent.

More than $30 billion of the automotive deficit is due to the deficit in passenger cars. *Figure 1H* shows that the rapid rise of the 1970s in import penetration counted by number of units has been halted, largely thanks to the Japanese export quotas. But the dollar value deficit in passenger cars with Japan continues to grow: from $9 billion (imports f.a.s.) in 1981 to more than $16 billion in 1985. The growth in the deficit with Canada under the bilateral auto agreement has contributed an additional $2 billion—from a $3 billion deficit in 1981 to a $5 billion deficit last year.

Other consumer goods imports have shown a tendency to expand rapidly in the face of domestic U.S. growth. Perhaps the most notable increase in a product category

Figure 1G
U.S. Manufactures Trade—Major Product Categories, 1981-1985

	U.S. EXPORTS			U.S. IMPORTS			BALANCE		
	1985 ($bil)	CHANGE fr '84 (%)	CHANGE fr '81 (%)	1985 ($bil)	CHANGE fr '84 (%)	CHANGE fr '81 (%)	1985 ($bil)	CHANGE fr '84 ($ bil)	CHANGE fr '81 ($ bil)
TOTAL TRADE (Imports c.i.f.)	213.1	-2	-9	361.6	6	32	-148.5	-25.2	-108.8
Agricultural Products	29.6	-22	-32	22.0	2	18	7.6	-8.6	-17.1
Manufactured Goods	145.4	2	-6	258.2	11	73	-112.8	-24.0	-118.0
Petroleum Products	4.7	4	27	51.5	-12	-34	-46.8	6.9	28.0
TOTAL TRADE (Imports customs value)	213.1	-2	-9	345.3	6	32	-132.2	-24.3	-104.6
Agricultural Products	29.6	-22	-32	20.0	1	18	9.6	-8.4	-16.7
Manufactured Goods	145.4	2	-6	246.8	11	73	-101.4	-23.0	-113.1
Petroleum Products	4.7	4	27	49.6	-11	-34	-44.9	6.5	27.0
BY "END-USE" DEFINITION (Imports customs value)									
Capital Goods	73.9	3	-8	65.1	9	89	8.8	-3.4	-36.9
Automotive Products	22.9	11	27	66.8	25	125	-43.9	-11.0	-32.2
Consumer Goods	12.6	-5	-20	68.3	14	76	-55.7	-9.0	-32.8
Industrial Supplies & Materials (excluding petroleum)	53.5	-6	-16	63.1	-5	10	-9.6	-0.2	-16.0
MANUFACTURED GOODS BY MAJOR SITC CATEGORIES (Imports customs value)									
Chemicals (SITC 5)	21.8	-3	3	14.5	6	54	7.3	-1.4	-4.5
Basic Manufactures (6)—	14.0	-7	-32	46.5	1	25	-32.5	-1.5	-15.8
Paper	2.3	-12	-23	6.0	7	54	-3.7	-0.7	-2.8
Textiles	2.4	0	-33	4.9	9	63	-2.5	-0.4	-3.6
Iron & Steel	1.2	-8	-59	10.3	-6	-8	-9.1	0.5	-0.8
Nonferrous Metals	1.5	-6	-25	7.0	-15	0	-5.5	1.1	-0.5
Machinery & Transport Equipment (7)—	94.3	5	-1	137.3	15	97	-43.0	-13.8	-69.1
Office Machines & Computers	14.9	2	52	11.6	7	222	3.3	-0.5	-2.9
Electrical Machinery & Parts	12.5	-9	9	17.7	-3	92	-5.2	-0.7	-7.5
Power Generating Machinery (including engines)	9.3	2	-2	8.8	21	91	0.5	-1.3	-4.4
Nonconsumer Telecom. Equipment	4.2	8	8	9.5	12	106	-5.3	-0.7	-4.6
Construction & Special Purpose Machinery	8.4	5	-24	6.2	11	63	2.2	-0.2	-5.1
General Industrial Machinery & Parts	7.4	-6	-36	8.1	17	65	-0.7	-1.7	-7.3
Machine Tools & Metalworking Machy.	1.2	0	-45	2.8	40	40	-1.6	-0.8	-1.8
Agricultural Machinery & Tractors	1.6	-6	-54	1.4	-7	8	0.2	0.0	-2.0
Automotive & Transport Equipment—									
Cars	6.0	22	54	36.5	25	109	-30.5	-6.2	-16.9
Automotive Parts	9.4	3	26	10.3	17	151	-0.9	-1.3	-4.4
Aircraft & Parts	14.4	32	2	3.6	20	38	10.8	2.9	-1.3
Miscellaneous Manufactures (8)—	15.3	-3	-8	48.5	14	85	-33.2	-6.4	-23.7
Professional, Scientific & Controlling Instruments	6.5	5	8	3.2	19	88	3.2	-0.2	-1.1
Clothing	0.8	0	-33	14.9	10	99	-14.1	-1.4	-7.4
Toys, Games & Sporting Goods	0.6	-14	-45	4.1	24	86	-3.5	-0.9	-2.4

Source: NAM, from statistics in Commerce Department, *Highlights of U.S. Export and Import Trade.*

deficit was in clothing and apparel: a $7.8 billion worsening of the deficit in clothing with a 99 percent increase in imports since 1981 (*Figure 1G*).

In many other consumer products, low traditional import penetration ratios increased significantly since 1981, as shown in *Figure 1H*. Import penetration went from 9 to 15 percent in home appliances and from 7 to 14 percent in furniture, for example. And already high import ratios have expanded still further: from 59 to 63 percent in radio and television sets and from 33 to 58 percent in leather shoes. It is probably fair to say that foreign products are so well established in the U.S. market at this time in many of these product lines that government efforts to "roll back" import growth will meet strong consumer resistance, particularly if foreign suppliers are willing to absorb exchange rate changes so they can hold market share in the United States.

Figure 1H
Ratio of U.S. Trade to Production and Consumption: Selected Manufactured Goods Categories, 1972-1985

PRODUCT GROUP	EST. TOTAL 1985 U.S. SHIPMENTS	REAL AVG. ANNUAL GROWTH 1972-85	IMPORTS AS SHARE OF DOMESTIC CONSUMPTION			EXPORTS AS SHARE OF DOMESTIC PRODUCTION		
A. HIGH TECHNOLOGY & ELECTRONIC PRODUCTS			1972	1981	1985	1972	1981	1985
Computers	$53.4 billion	n.a.%	4%	7%	18%	22%	29%	29%
Semiconductors	14.9	33.7	15	34	40	20	35	32
Instruments								
Engineering & Optical Instruments	9.5	9.2	10	19	16	12	36	26
Measuring & Control Instruments	10.2	5.9	4	5	6	19	21	16
Electricity Measuring Instruments	8.8	9.4	8	12	12	20	31	22
Telephone Equipment	15.4	5.0	2	4	12	7	7	5
Radio-TV Communications Equipment	42.7	7.9	3	7	7	7	9	7
Areospace—								
Civilian Aircraft	11.4	3.1	2	22	18	28	65	39
Engines	13.5	4.5	6	14	16	19	20	24
Other Aircraft Equipment	14.5	2.3	11	18	19	26	41	39
Photographic Equipment	15.9	3.8	7	15	19	12	16	14
Indust. Inorganic Chemicals	16.1	0.1	10	21	19	18	25	20
B. SELECTED OTHER INDUSTRIES								
Electrical Equipment—								
Transformers*	$3.5 billion	-0.3%	3%	6%	10%	3%	8%	6%
Motors & Generators*	7.0	0.1	5	10	16	9	12	10
Machine Tools**	4.2	-3.1	10	27	45	20	20	18
Construction Machinery	12.0	-2.7	2	9	16	28	41	21
Farm Machinery	8.6	-1.8	10	13	20	11	23	22
Oil Field Machinery	6.1	4.6	1	4	1	45	42	52
General Industrial Machinery—								
Internal Combustion Engines	11.8	2.0	6	6	5	15	24	17
Compressors	2.7	3.5	8	9	16	28	32	25
Pumps	5.2	1.4	4	9	10	16	18	17
Motor Vehicles (All types)	97.0	1.0	8	19	20	2	5	2
(Passenger Cars-Units)	—	—	15	27	26	—	—	—
Steel Mill Products***	50.7	-2.6	17	19	24	3	3	1
Household Appliances	15.2	1.2	7	9	15	4	10	6
Household Furniture	16.3	0.6	3	7	14	1	2	1
Radio & TV Sets	7.1	6.1	37	59	63	4	10	8
Footwear—								
Leather Shoes	3.8	-4.3	17	33	58	0	2	3
Rubber & Plastic Shoes#	n.a.	-6.8	28	61	63	—	—	—
Textiles & Apparel—								
Textile Mill Products	54.1	0.9	5	6	7	3	7	3
Man-Made Fibers	9.7	3.7	5	1	3	5	17	11
Apparel	48.0	0.6	7	12	25	1	2	2

*Electrical equipment 1985 data based on unpublished Commerce Department data on industry shipments.

**Machine tool trade ratios based on data in special trade tables and unpublished Commerce Department estimates.

***Steel trade on tonnage basis.

#Domestic industry growth and trade figures based on Commerce Department data for waterproofed and rubber sole/fabric upper shoes.

Source: NAM, from data in Commerce Department, *U.S. Industrial Outlook, 1986* and unpublished data.

Can We Achieve a Zero Trade Deficit in Manufactures?

Figure 1I indicates that even given favorable assumptions regarding trade balances in nonmanufactured goods, we may have to achieve a zero deficit in manufactures in order to wipe out our trade deficit and return to a surplus in the overall current account. Even if we could regain most of our lost agricultural surplus and knock another $25 billion off the oil deficit, all of the current $113 billion manufactures deficit would have to be eliminated if we are to reduce the trade deficit to zero.

Figure 1J shows a possible "high export" approach to achieving this goal. This table defines our deficit in terms of "end-use" sectors, which is different from *Figure 1I*, but easier to understand in terms of our previous analysis.

The key element is expansion of our high technology capital goods surpluses back to 1981 levels. In computers, electrical machinery, nonconsumer telecommunications equipment and instruments, our imports have doubled or tripled since 1985. With stronger foreign growth policies, better market access, accelerated international industrial modernization and favorable exchange rates, we could conceivably double our exports in these products by 1990. In addition, we now have combined exports of $23 billion in aircraft and power-generating machinery (including aircraft engines), which could increase another 30-50 percent. We could thus achieve a $40 billion increase in the total surplus in these high-tech products by 1990 even if we allow for another 25-30 percent increase in total imports. To this we could conservatively add a $10 billion improvement in other capital goods trade balances due to favorable exchange rate and business cycle developments. This would give us a $50 billion improvement in the capital goods sector.

Our only major assumption regarding reduction of imports would have to be in the automotive products sector. We would not need to eliminate our deficit or even reduce it to 1981 levels. But, increased production in the United States by foreign-owned (especially Japanese) makers and the U.S. sourcing of many original and replacement parts (a process that has already begun) could contribute to a substantial reduction of this deficit. Moreover, we could phase in changes in the operation of the U.S.-Canadian automotive agreement that would eliminate the current trade advantage held by Canada, in exchange for improved Canadian trade access to the U.S. market across the board. We have thus projected a possible $24 billion reduction in the automotive deficit by 1990.

With respect to consumer goods, we have already stated that it will be difficult to achieve a major trade saving, and the U.S. export role is relatively small, even if foreign markets grew rapidly. We have, therefore, targeted only a $6 billion reduction in this deficit by 1990 to a level of $50 billion. Such a change is predicated on reduced U.S. consumer buying power because of exchange rate developments and the relative attractiveness of some reversion to U.S. sourcing.

Finally, we would need about a $20 billion positive swing in nonpetroleum industrial supplies and materials. About a third of this change could be achieved in chemicals since exchange rates and relative price levels play a crucial role

Figure 1I
1990 "Zero Deficit" Trade Balance—Major Economic Sectors

U.S. Trade Balances (imports c.i.f.) ($ billion)

Sectors	1981	1985	1990	'85-90 Chg
Agriculture	25	8	20	12
Petroleum	-75	- 48	-25	23
Manufactures	5	-113	0	113
Other	5	4	5	1
Total Trade	-40	-149	0	149

Figure 1J
1990 "Zero Deficit" Trade Balance—Major Manufactured Goods Categories ("End-Use Basis")

U.S. Trade Balances (imports f.a.s. or customs value) ($ billion)

"End-Use" Categories	1981	1985	1990	'85-90 Chg
Capital Goods	46	9	60	51
(High Technology Goods Only)	27	5	45	40
Automotive Products	- 12	- 44	- 20	24
Consumer Goods	- 23	- 56	- 50	6
Industrial Supplies (ex. Oil)	7	- 10	10	20
Total, Four End-Use Sectors	18	-101	0	101

in sourcing relatively undifferentiated products from similar plants. We had a $12 billion U.S. trade surplus in 1981 compared to about $7 billion in 1985. We could recover and even improve on this earlier level of surplus because the United States is highly competitive in many sectors of the chemical industry. The remainder of the gain would be spread across other basic industries. Again, favorable price developments would help U.S. producers. Added to this would be limited, sectorally specific policies designed to slow the rate of import growth. Such policies have already been adopted by the Reagan administration with the extension and renegotiation of the Multi-Fibre Agreement and steel import quotas.

This set of projections regarding changes in our manufactured goods "end-use" category balances should not be taken as a prediction of what will happen. Rather it shows what changes could be made, bearing in mind the present strengths and weaknesses of the U.S. industrial economy, if we adopt an export-oriented approach to a national trade strategy. If the United States must reduce its trade and current account deficits any time soon, the more unpleasant alternatives would be a deliberate reduction of imports through protectionist legislation or a severe and unplanned recession that dramatically reduces import demand.

II. Impact of the U.S. Trade Deficit: Home and Abroad

The rise in the U.S. trade deficit has had a substantial and negative impact on the U.S. domestic economy, especially the manufacturing sector. The result has been a severe dampening of U.S. growth following an initial spurt in the immediate post-recession period. Continuing strong capital inflows into the United States associated with our current account deficit have also made promotion of growth and investment difficult in many foreign economies. On the other hand, there would have been no recovery in world trade from the 1981-83 recession without the major stimulus of U.S. imports, and little or no domestic economic growth in many foreign countries. The last part of this chapter provides some estimates of the positive impact of our trade deficit on our trading partners' growth and indicates how the U.S. trade deficit could be readjusted on a region-by-region basis if we are to approach a zero trade deficit that does not jeopardize continued world economic recovery. A careful examination of the problem shows that it is very difficult to conceive how a geographical distribution of the U.S. trade deficit elimination might be achieved without sharply negative growth consequences for some trading partners.

Effect on the U.S. Economy

The deterioration in the U.S. trade balance has caused the overall domestic economic growth rate to fall to unsatisfactory levels after a robust recovery in 1983-84. From the first quarter of 1983 through the third quarter of 1984, the economy grew at an annual rate of 6.6 percent. From mid-1984 through the end of 1985, the growth rate was only 1.8 percent. Had the deficit in our net exports of goods and services in the GNP account not worsened further, the growth rate would have been 3.0 percent. If we could have eliminated our net export deficit (as is normal in the latter stages of a recovery) the annual rate of growth would have been 5.0 percent since mid-1984.

Assessment of the trade deficit's impact has led to a possible reversal of traditional assumptions regarding the inevitable economic benefits of trade for the U.S. economy. In January 1986, Commerce Department senior economist David Lund studied the employment impact of trade in his paper, "Employment Effects of U.S. International Trade Changes." Citing a sharp productivity squeeze in export-oriented industries, Lund noted that the modest recovery of U.S. exports in 1984 made no net contribution to increased employment. He estimated that total export-related employment in 1984 remained almost 1.1 million jobs below the 1980-81 peak of 4.8 million jobs—a fall of about 25 percent in just three years. On the import side, he reported that by 1984 there was a total job loss of 1.5 million due to higher imports. Even after attributing about half of this loss to a continuation of longer-term rising import trends, Lund found a net displacement of 700,000 jobs due to the upsurge of imports since 1981. Thus, despite an overall increase in the total number of jobs, Lund estimated that the U.S. unemployment level was 1.1 percentage points higher than it would be without 1980-84 trade trends.

These figures tend to be confirmed by more recent employment data. Total employment in manufacturing remains nearly 2 million short of the prerecession peak (19.4 million against more than 21 million jobs in 1979). Both the national unemployment rate and unemployment in manufacturing remain at 7.0 percent or above, compared to 5.8 percent in 1979 or 4.9 percent in 1973—two similar points in a "mature" growth cycle. While there has been a great deal of political emphasis on the gross number of jobs created in a dynamic U.S. economy, it appears that there has been a permanent loss of jobs in manufacturing due to the impact of trade, not to mention job losses in agriculture, mining and other trade-affected sectors.

Recent estimates of stronger growth (more than 3 percent) in the first quarter of 1986 only confirm this analysis. A reduction in the GNP net export deficit, perhaps due to changes in the dollar exchange rate and cheaper oil, provided a major impetus to improved growth.

Effect on Foreign Economies

Since 1981, the growth in American imports has been responsible for injecting a degree of growth in the world economy and possibly preventing a collapse of the international trading system. According to figures provided by GATT and the IMF, the total value of world trade, measured in current dollar values of total world exports, was still 4 percent less in 1984 than in 1981. The gap would have been twice as large—8 percent—without the rapid growth of U.S. imports.

But on the other hand, U.S. macroeconomic policies, particularly the rising federal budget deficit, have seriously distorted world investment patterns. The need to finance the deficit (plus lingering inflationary expectations) caused extremely high real interest rates in the United States at the same time the budget deficit itself stimulated domestic growth. The United States thus provided a capital market that was politically safe and flexible enough to accommodate all types of foreign investment, be it portfolio investment in safe government bonds, direct investment to improve position in a fast-growing market or more speculative investment in the stock market or real estate. And the continued appreciation of the dollar conferred windfall gains on those who switched investments out of foreign currency assets into dollar assets—including U.S. corporations, which made virtually no new net direct foreign investments between 1981 and 1984.

While he was chairman of the President's Council of Economic Advisers, Martin Feldstein calculated that this foreign capital inflow effectively paid for 40 percent of the federal budget deficit. Certainly it helped make the Federal Reserve's anti-inflationary policies work without keeping nominal interest rates at the high levels of 1980-81 but still allowing accommodation of the federal deficit. But, as noted by Feldstein in a more recent paper on U.S.-European economic relations, we have paid for this increase in capital inflows with a discouragement of foreign economic growth and an effective targeting of exports on the U.S. market.

The effects of such a policy reorientation show up in the bilateral U.S. trade balances as well as in the overall trade deficit. U.S. exports have stagnated or fallen in most cases, while imports have increased dramatically. Details of export and import changes in U.S. trade balances by regional groupings are given in *Appendix 2*. The major trends are shown in *Figure 2A* and can be summarized as follows:

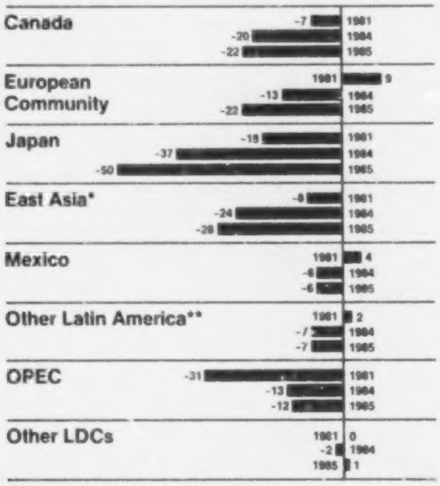


Figure 2A
U.S. Trade Balances With Major Trading Partners
$ Billions (Imports c.i.f.)

*Excluding Indonesia, which is counted with OPEC.
**Excluding Venezuela and Ecuador, which are counted with OPEC.

Source: NAM, from Commerce Department, *Highlights of U.S. Export and Import Trade.*

Japan. One-fourth of the total increase in the trade deficit with non-OPEC countries is due to a net $32 billion worsening of the deficit with Japan. Despite a Japanese annual growth rate of nearly 4 percent in 1981-85, our exports have remained almost unchanged since 1981. But U.S. imports from Japan have nearly doubled, from $40 billion to $72 billion. Our total deficit increased from $18 billion to $50 billion (imports c.i.f). The worsening deficit in passenger cars accounted for less than a quarter of the total change.

East Asia. Taiwan, Korea, Singapore and Hong Kong have accounted for nearly all of the $20 billion increase in the U.S. trade deficit with the East Asian developing countries. These East Asian newly industrializing countries (NICs) have based their relatively high growth rates to a large degree on exports to the U.S. market.

Taiwan alone has accounted for a net swing of nearly $9 billion. Its surplus of $13 billion with the United States in 1985 was larger than any country except Japan and Canada, our two largest trading partners. Total U.S. c.i.f. imports from Taiwan in 1985 were $17.8 billion, more than double the 1981 level, while U.S. exports were just $4.7 billion or less than 10 percent higher than in 1981.

The growth rate of Korea's exports to the United States is proportionately more modest. According to U.S. figures, trade moved from a near balance in 1981 to a deficit of $4.7 billion, but this was less than half of the swing in the case of Taiwan. U.S. imports nearly doubled, from $5.8 billion to $10.7 billion, but U.S. exports of $6 billion were also 18 percent higher.

The two smaller Asian NICs also showed substantial gains in trade with the United States, especially in view of the size of their economies. The U.S. deficit with Hong Kong nearly doubled, from $3.2 billion to $6.2 billion, a net $3 billion change. U.S. exports were flat, while imports increased 55 percent. In the case of Singapore, U.S. imports actually doubled, from $2.2 billion to $4.4 billion, though this was offset by a 20 percent increase in U.S. exports to $3.5 billion. Nevertheless, the U.S. trade balance changed from an $800 million 1981 surplus to a $900 million 1985 deficit, a $1.7 billion negative swing.

European Community. Turning to Europe, it is still not well enough appreciated that the swing in Europe's trade balance with the United States of more than $30 billion since 1981 is as large as Japan's. One reason is that Europe moved from a net deficit to a surplus, so the domestic import penetration level is not as noticeable as in the case of Japan. And unlike Japan and the Far East, U.S. exports to the EC countries were $6 billion less than in 1981, so that an absolute fall in exports is also a component of the U.S. deficit.

Among the four major EC economies, all except the United Kingdom relied heavily on increased exports to the United States as the major stimulus for economic growth in the 1980s. While intra-EC trade continues to dominate their exports, all except Britain roughly doubled the share of exports going to the U.S. market. Germany, considered the economic engine of Europe, is especially notable here; the Germans alone increased exports to the United States by $9 billion.

Canada. Using U.S. figures, our deficit with Canada, already increasing as of 1981, has worsened by $15 billion since then. In this case, there has been a substantial increase in U.S. exports to Canada of $7.7 billion (19 percent), our largest anywhere. But about a third of this increase was in automotive parts under the two-way U.S.-Canadian agreement, and U.S. imports of vehicles have offset the export gain.

Latin America. Together, Japan and the Far East, Europe and Canada roughly account for the net change in the U.S. trade deficit of about $100 billion since 1981. One way of looking at the $20 billion-plus increase in the deficit with all of Latin America is to count it as the reverse side of the $19 billion improvement in our trade balance with OPEC—especially as oil exporters Venezuela, Ecuador and Mexico (the last of these a non-OPEC country) alone account for about half of the change. But in 1985, about one-third of all U.S. imports from Latin America were classified as manufactured goods. The financial "near collapse" of Latin America and the international debt problem have also had a critical impact on U.S. manufactured exports—about half the change in the U.S. trade balance with the Latin American region is due to a net fall of more than $10 billion in U.S. manufactured exports.

Mexico alone accounts for nearly half the U.S. trade balance deterioration with Latin America. Since 1981, U.S. exports have fallen by $4.2 billion, while imports rose $5.4 billion—a net change of nearly $10 billion. The second biggest net change is with Brazil, but here the pressure has been mostly on the U.S. import side. U.S. exports fell from $3.8 billion to $3.1 billion, while imports rose from $4.9 billion to $8.1 billion (65 percent), and the U.S. deficit with Brazil expanded from $1.1 billion to $5.0 billion. The remainder of our deficit with the Latin American nations is mainly accounted for by Argentina and Venezuela. The United States has lost a big market in Argentina, as our exports fell from $2.2 billion in 1981 to just $700 million in 1985, accounting for the total net change in our bilateral trade balance. And while the United States scored its only major positive trade balance change with the OPEC nations as a group, our bilateral deficit worsened by $3 billion with OPEC member Venezuela.

OPEC. The fall in the U.S. deficit with OPEC is the only bright spot in development of U.S. regional trade balances in 1981-85. The 1981 net U.S. deficit fell from $31 billion in 1981 to just $12 billion last year. This is not all good news because the fall in U.S. exports to OPEC—mainly manufactured goods—was more than $8 billion. This offset a good part of the net $27 billion U.S. gain from lower OPEC oil imports. If the U.S. economy is to continue to benefit from cheaper oil from a greater diversity of sources, we will also have to work harder to replace the OPEC market for our manufactures.

Can We Achieve a Zero Trade Deficit Without Destabilizing World Growth?

The United States must reduce its trade deficit without seriously harming the growth prospects of many foreign economies. For most of our trading partners, recovery from the recession of the early 1980s has been only weak or partial. Reduction of our own federal budget deficit and interest rates will assist in creating conditions conducive to more domestically oriented growth and investment in foreign economies. This would not only stimulate demand for U.S. exports of manufactured and agricultural goods, it would also create demand for third-country exports and reduce the disproportionate role played by the U.S. market in the continuing world trade recovery. The falling dollar could also make oil and other primary commodity imports more affordable for the advanced industrial countries while it makes dollar-denominated debt burden easier to bear for many Third World countries.

In considering how the reduction of the U.S. trade deficit could take place, we must also consider the impact on the future growth prospects of foreign economies. Most foreign countries are now overreliant on exports to the U.S. market to stimulate domestic growth. This does not mean, however, that a reduction in the rate of growth of U.S. imports and the net U.S. trade deficit would be an equal burden on all our trading partners.

Figure 2B shows how large a role the growth of exports to the United States has played in contributing to growth in other economies. These calculations are only indicative of impact levels and are based on tentative growth estimates, not precise data. But they show in a sometimes startling way how important exports to the United States have been as a source of growth around the world and what it would mean for our trading partners to surrender the share of the U.S. deficit that has been gained since 1981. Next, *Figure 2C* provides a summary of how more than $100 billion in the reduction of the U.S. trade deficit could be distributed with a minimal negative impact on growth in foreign economies.

Japan, the biggest single beneficiary of the U.S. trade deficit, has had one of the smallest proportionate domestic growth gains from increasing exports to the United States. The increase in the level of exports to the United States from Japan was equivalent to less than 20 percent of Japa-

Figure 2B
Exports to U.S. as Share of Growth in Major Trading Partners, 1981-1985

	Exports to U.S. as Share of Total Exports (%)		Growth, 1981-85		
Country	1981	1985	Average Annual Change (%)	Exports to U.S. as Share of Growth (%)	Less Increase in Exports to U.S. (%)
Canada	64	77	1.8	55	0.9
Japan	26	41	3.8	18	3.1
European Community					
Germany	7	12	1.3	43	0.8
United Kingdom	12	15	2.3	13	2.0
France	5	10	1.1	26	0.8
Italy	7	13	0.8	39	0.5
East Asia					
Taiwan	38	53	6.6	62	2.7
Korea	27	38	7.3	26	5.5
Singapore	13	21	5.2	66	1.9
Hong Kong	28	30	4.8	45	2.7
Latin America*					
Mexico	55	76	0.3	590	-1.6
Brazil	18	30	2.4	17	2.0
Venezuela	26	39	-1.7	69	-2.9

*Growth rates for Latin America based on estimates provided by Morgan Guaranty Bank, *World Financial Markets* (February 1986) and IMF price data.

1985 growth based on first three quarters at annual rates, except for Taiwan (based on full annual estimate) and Latin America, as noted.

Sources: International Monetary Fund, *International Financial Statistics*, and *Direction of Trade Statistics*; unpublished Commerce Department trade data; OECD, *Quarterly National Accounts*; UN *Monthly Bulletin of Statistics*; and national data for East Asian growth rates.

Figure 2C
1990 "Zero Deficit" Trade Balance—Major Trading Partners

Trading Partners	U.S. Trade Balances (imports c.i.f.) ($ billion) 1981	1985	1990	'85-90 Chg
Canada	- 7	- 22	-10	12
European Community	9	- 22	- 5	17
Japan	-18	- 50	-20	30
East Asia	- 8	- 28	-10	18
Mexico	4	- 6	- 3	3
Other Latin America	2	- 7	3	10
OPEC	-31	- 12	0	12
Other LDCs	0	1	5	4
Total, This Group of Partners	-49	-146	-40	106
Grand Total	-39	-149	-30	—

nese growth (3.8 percent against 3.1 percent without an increase in exports to the United States). There may be more scope in Japan than in most other U.S. trading partners for reducing the level of the bilateral surplus in trade without severely negative consequences for the domestic economy, though this would clearly involve a major reordering of Japanese domestic priorities. Such a change is clearly envisaged in the Maekawa Commission report, presented to the Japanese government in April 1986. It remains to be seen whether the policy guidelines of this report will be converted into effective policy changes.

The East Asian NICs have all relied on exports to the United States to boost their domestic growth by a proportionately higher degree--ranging from 26 percent in Korea to 62 percent in Taiwan and 66 percent in Singapore. And the average annual growth rates in each of these countries has been 5 percent or higher. GNP changes in the East Asian area have become closely linked to those in the United States—and, by inference, to the growth of the U.S. trade deficit.

Together, Japan and the East Asian NICs have accounted for a $50 billion net deterioration in the U.S. trade balance since 1981. These five countries have also had growth rates that stand out from the recessionary or low-growth trends of the early 1980s in many other countries. The rapidly appreciating yen and falling oil and other commodity price levels negate the traditional Japanese argument that a large manufactured goods trade surplus is essential to pay for raw material imports—as is evidenced by the rapid growth of Japan's overall current account surplus to $50 billion at an annual rate in 1985.

By contrast to the appreciation of the yen, the other East Asian NICs have experienced a continued real depreciation of their currencies against the U.S. dollar in 1985, even as the U.S. dollar fell sharply against major industrial country currencies. This series of bilateral depreciations is entirely inappropriate given not only trade balances but also given the relatively positive economic outlook for these economies compared to other regions of the world. But none of these countries has an internal market large enough to absorb a reduction of export-led growth to the degree possible in Japan. If the Japanese complain that many U.S. products are unsuitable for the Japanese market, this is hardly true of the manufactured goods of the other East Asian countries (notably textiles, clothing, consumer electronics, electronic components and computers and parts). Also, Japanese labor costs, though still low by U.S. standards, are two to three times higher than in the East Asian NICs. If the Asian economies would trade more with each other in industrial goods, there is much scope for a relatively good match between comparative advantages that would allow continued export growth while reducing the reliance of these countries on the U.S. market. If U.S. capital goods were again more competitive on world markets, there would be a considerable possibility of rolling back much of the increase in the U.S. trade deficit with Japan and East Asia, while allowing for continued growth and export expansion in that region. We would therefore argue that U.S. trade corrections of $30 billion with Japan and $18-$20 billion with other East Asian countries are entirely possible. But they would require lower, though still positive, local domestic growth and reorientation of trade priorities for these countries.

The shift in the European Community's trade balance with the United States was not only as great as Japan's but Europe was also relatively more reliant on exports to the United States to stimulate growth. Though exports to the United States account for less than 20 percent of all exports for each major EC member country, the low positive growth rates in Germany, Italy and France were disproportionately reliant on the rapid increase of exports to the United States. This included nearly half of Germany's total growth and almost 40 percent of Italy's. In Britain's case, the low ratio of exports to the United States as a share of total growth is due principally to the role of oil exports in the trade balance.

An analysis undertaken in 1983 by the French bank Paribas found that all of the net change in the European trade balance with the United States was due to changing exchange rates. If this analysis still generally applies today, then the rapid upward movement of all major European currencies against the dollar since early 1985 could mean a decline in competitiveness on the U.S. market. Some relaxation of fiscal and monetary policies, lower interest rates and, over the longer run, a successful implementation of the EC official proposal to reduce barriers within the EC internal market, could have a positive effect in shifting the focus of growth away from the U.S. market. The European economies as a group, however, face serious structural problems and have yet to prove competitive at world levels in many key high-tech and electronic product industries.

It is, therefore, our conclusion that the United States should not rely on regaining the $9 billion surplus position it held in trade with the EC in 1981. A reduction of the deficit by $17 billion, from $22 billion in 1985 to around $5 billion, would be equivalent to about half the 1981-85 deterioration in the U.S. position. This is possibly the most we can expect unless future growth in Europe is much more robust and structural adjustment of EC economies is accomplished more swiftly than we now expect.

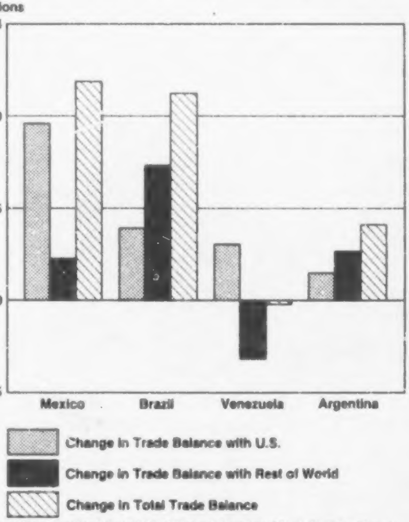
An increase in the U.S. share of Canadian exports from 64 percent to 77 percent of the total since 1981 indicates the conclusive failure of the Liberal governments of the 1970s to diversify potential Canadian export markets. In part, this strategy was doomed by a continuation of the *de facto* linkage of the Canadian dollar to the U.S. dollar: even though the C-dollar has depreciated 20 percent on a bilateral basis since 1980, it tended to appreciate on world markets against other currencies at least through 1984. To pull out of the recession of the early 1980s, Canada relied on exports to the United States for 55 percent of total growth since 1981.

The liberalized bilateral trade initiative undertaken by Canada over the past three years is evidence of the recognition of the realities of this situation and of the increased need to protect Canadian exports from possible U.S. legislative retaliation. But a freer market that institutionalizes a bilateral Canadian surplus of the present magnitude is probably unacceptable in the United States—with respect to both specific product categories and the general advantage gained by Canadian producers.

With or without liberalized trade, we would expect some reduction in the present U.S. deficit. However, both Canada's growth and inflation rates over the past two years have been higher than in the United States and Canada's federal budget deficit problem has proved equally intractable. This may mean that there is little scope for redirecting Canadian growth strategies more toward the internal market. While some improvement of the trade balance from the U.S. side may be possible, a return to a zero balance (using U.S. calculations) would probably be devastating for Canada unless there were an unexpected world boom in demand for Canada's nonmanufactured exports. We might, therefore, expect a $12 billion improvement in our balance with Canada, to a net U.S. deficit of $10 billion by 1990.

As shown in *Figure 2D*, the U.S. trade account has thus far borne the brunt of the balance of payments correction in Latin America necessitated by the debt crises. More than 80 percent of the $12 billion improvement in the Mexican trade balance between 1981 and 1985 is due to the net trade change with the United States. Moreover, as shown in *Figure 2B*, the increase in exports to the United States was six times the estimated total added GNP in Mexico, and allowed the growth rate to remain roughly level instead of suffering a major fall over the period. In the case of Venezuela, an improved trade balance with the United States almost exactly offset a fall in the balance with other countries, facilitating the process of adjustment to cover international debt obligations. And the rise in total exports to the United States, though only about $1 billion since 1981, offset about 70 percent of the net fall in growth otherwise. The cases of Argentina and Brazil are particularly interesting because the United States has less than a 20 percent share of each country's import market, but an improvement in the trade balance with the United States provided more than a third of the net improvement in each country's trade balance.

Figure 2D
Latin American Trade Balance Adjustment, 1981-1985



Sources: IMF, *International Financial Statistics* and *Direction of Trade Statistics*; Morgan Guaranty, *World Financial Markets* (February 1986).

With the long-term future of oil and commodities markets and debt repayment programs still so uncertain, we cannot count on a total reversal in the U.S. trade position with the Latin American countries and the regaining of a 1981 surplus position. There is no reason, however, why U.S. exports should not be more competitive in Brazil, given that other G-5 countries such as Japan and Germany are our key competitors. With a restructured debt program, an encouragement of greater openness to foreign-made goods undertaken in conjunction with debt rescheduling and more competitively priced U.S. exports, we could see a gain of at least $3 billion in our bilateral balance and possibly eliminate our deficit altogether. Similar gains could be achieved with Mexico and Venezuela under conditions created by successful negotiations to stretch out debt repayment, since U.S. suppliers are already the major factors in both markets. Halving our deficit with Mexico to $3 billion and an overall $10 billion gain elsewhere—chiefly focused on Brazil—would leave the United States with a net zero balance in Latin America.

To this group of countries we could add the OPEC countries, where we have already achieved a substantial trade deficit reduction, and the other less developed countries, where we have seen little net change since 1981. Continued diversification of oil supplies and lower prices could lead to an elimination of our $12 billion deficit with

OPEC by 1990. Conversely, if we do buy *more* rather than *less* oil from OPEC for price reasons, then we should expect to export more, and this again could reduce the net deficit. Finally, improved growth prospects and trade recovery in the other developing countries could help increase our present small surplus. Overall, we could look for a $12 billion gain with OPEC and a $4 billion gain with the other LDCs.

As shown in *Figure 2C*, these hypothetical U.S. trade gains would still leave us $40 billion short of a zero trade deficit goal, though it would roll back the deterioration since 1981. Trade gains with other trade partners not listed (non-EC Europe and Australia, for example) could follow from the general conditions of improvement in U.S. trade balances. But that still leaves us short of our goal. To achieve a zero trade deficit by 1990, we will need even greater levels of improvement with some of the partners discussed here, or a major and presently unanticipated favorable change of conditions in potential major markets such as India, China or the Soviet Union and Eastern Europe.

III. A Blueprint for U.S. Trade Strategy

As set out in this report, the principal goal of U.S. trade strategy should be to reverse the worsening trade deficit by improving the competitiveness of U.S. goods manufactured in home and export markets. Encouragement of growth-oriented policies in foreign economies and the recent fall in the dollar can help create improved market opportunities. But there is a long agenda of other specific policy actions and proposals that needs to be addressed if U.S. trade competitiveness is to be maximized. This chapter focuses on three different sets of issues that comprise the major components of a national trade competitiveness strategy:

- Completion and consolidation of the task of dollar realignment to improve U.S. manufacturers' price competitiveness;
- Policy changes that will have a short-term impact on U.S. trade performance; and
- Policy changes that will improve the ability of U.S. companies to compete in the global market over the longer term.

The January 1985 report of the President's Commission on Industrial Competitiveness, chaired by John Young, considered some of the policy issues raised under the last two points. This report has yet to receive the attention or action it deserves. In discussing short- and long-term policy issues in the last part of this chapter, we will also focus on some of the proposals and evidence presented by the Young Commission.

Exchange Rate Policy

Over the past few months, the U.S. government has already undertaken one major policy initiative called for repeatedly by NAM and others concerned about the impact of the trade and balance of payments deficit. On Sept. 22, 1985 the U.S. government undertook, in collaboration with the "G-5" (Group of Five) major industrial countries, a coordinated exchange market strategy designed to reduce the rate of dollar misalignment. While the dollar had already started to decline from its February 1985 peak, the decline accelerated after the formal announcement by the G-5 central bank governors and finance ministers of their intentions and an active period of joint exchange market intervention. The downward movement of the dollar is summarized in *Figure 3A*.

The overall index of the dollar's value against the 10 leading industrial country currencies measured by the Federal Reserve (the so-called "G-10" index) rose steadily from 1981 through early 1985. By the first quarter of last year it hit an average value 52 percent above its 1981 level. As we discussed earlier, there is now little question that this rise in the value of the dollar is the primary immediate cause of the U.S. trade deficit deterioration.

As of early 1986, the dollar had come down sharply from its peak of a year ago. The average Fed G-10 index for the first quarter fell to only 16 percent over its 1981 level. But the dollar's downward progress has not been even against the world's major currencies and, as we mentioned in the last chapter, the dollar has actually continued to appreciate against some major trading partner currencies.

At this point there should be three major goals regarding exchange policy if we are to return to a balanced current account:

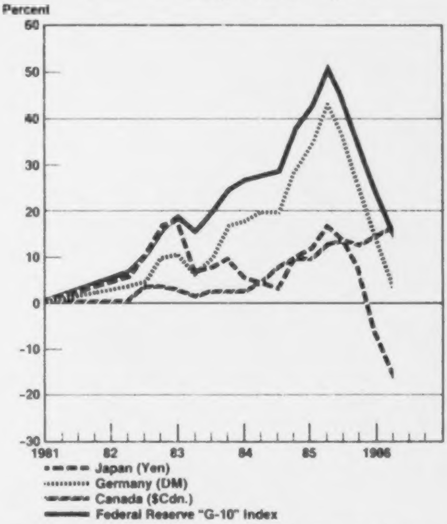
- Continued appreciation of the Japanese yen.
- Reversal of the falls in the Canadian dollar and NIC currencies against the U.S. dollar.
- Longer-term reform of the international monetary system.

Against the Japanese yen, the currency of the country with the largest bilateral trade surplus with the United States, the steep fall in the dollar by March 1986 left the U.S. currency 19 percent lower on a nominal basis than in 1981. This did not mean, however, that the United States had reversed the fall in its competitive position against Japan. Edward Bernstein, formerly chief technical adviser to the U.S. government at the Bretton Woods international economic conference, has stated in recent congressional testimony that, "...The U.S. price-competitive position vis-a-vis Japan remains seriously impaired. Since 1978, unit labor costs in manufacturing have risen by 36 percent in the United States and fallen by 14 percent in Japan. Assuming that the exchange rate was appropriate in 1978, when the trade deficit was $11.6 billion with Japan, the price-competitive position of the United States vis-a-vis Japan has deteriorated by a third or more in the past seven years."

For the United States to eliminate its balance of payments deficit on current account, Lawrence Krause of the University of Pennsylvania has calculated that the yen exchange rate of the dollar should be no more than 100 by 1990. Former Treasury Assistant Secretary C. Fred Bergsten, using a different calculation, has indicated that the bilateral exchange rate should be about 120 to 130 per

Figure 3A
Dollar Exchange Rate—Major Industrial Countries

Dollar's Nominal Value Measured Against 1981 Average Rate



Sources: Council of Economic Advisers, *Annual Report*; Federal Reserve Board data.

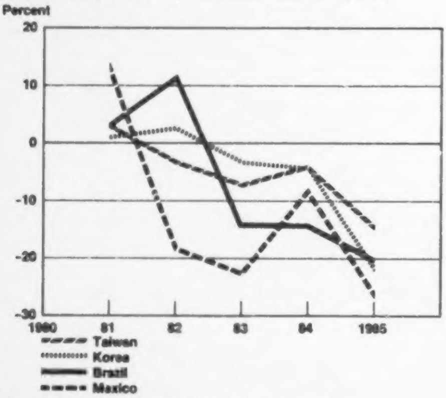
dollar. Such numbers indicate a consensus among economists that while the nominal exchange rate of the yen may now be near its postwar high against the dollar, a much greater appreciation of the yen will be required to reflect real changes in competitive performance.

Moreover, the dollar has not fallen at all against the currencies of some other major trading partners. *Figure 3A* shows that the Canadian dollar is now 17 percent higher than its 1981 value, at around 72 cents U.S. In early February, the Canadian government intervened in exchange markets when the C-dollar fell below 70 cents U.S., but the trend toward a lower Canadian dollar has not been decisively reversed.

Figure 3B indicates that the dollar exchange rate has also risen against the currencies of the newly industrializing countries that have made major inroads in the U.S. market. Calculated on a real basis to offset high inflation rates and rapid devaluation in some cases, the depreciation in these currencies actually accelerated in 1985. According to the Morgan Guaranty real exchange index, for example, the Korean won was only 4 percent below real 1980-82 parity in 1984, but fell to 21 percent below parity by December 1985. The Taiwan dollar was 14 percent below parity at the end of 1985 while the Brazilian and Mexican currencies were 20 and 26 percent lower. All of these currencies were also much lower nominally against the dollar.

Figure 3B
Currency Exchange Rates—Newly Industrializing Countries

Real Change in Effective Exchange Rates, Selected Developing Countries (Morgan Guaranty Index, Base 1980-1982 Average)



Source: Morgan Guaranty, *World Financial Markets* (February 1986).

The exchange rate has been widely perceived as a major contributor to the trade deficit, and the U.S. government has undertaken a program to realign the dollar downward. Lower exchange rates for NIC currencies reinforce an impression that these countries are using unfair tactics to gain advantages in export markets. Lower exchange rates for the Canadian dollar and the NIC currencies add to the political pressure for protectionist legislation in the United States.

Finally, the U.S. government, through whatever forum seems most appropriate, should address the subject of long-term reform of the international monetary system. In his 1986 state of the union message, President Reagan indicated that American farmers and other exporters should never again have to be concerned that exchange rate changes beyond their control will price their goods out of U.S. and world markets. Insuring an exchange rate appropriate to U.S. competitiveness levels and the balance of payments position will require changes from the present "floating rate" system—a system that often operates directly counter to the assumptions that led to its acceptance by the U.S. and other governments. Any new exchange rate system should be based on the cooperative experience of the G-5 governments since September 1985 and should introduce a degree of structure into the system. It should also improve the institutional arrangements for coordinating macroeconomic policies, since changes in fundamental economic performance may radically affect exchange rate relationships. The April 1986 meeting of the IMF Interim Committee, which called for development of a set of "objective indicators" of fundamental economic performance as a means to judge the appropriateness of exchange rate levels, could be the first step in this direction.

An exchange rate system that is less volatile and less prone to persistent dollar misalignment will be difficult to achieve. A return to the Bretton Woods system of so-called fixed exchange rates is not feasible at present, and a gold-based system seems to present insuperable problems. The leading candidate for a new system is a target or reference zone system. Under such a system, the dollar exchange rate with a few major currencies would be established by negotiation. This "reference rate" would then be maintained within broad bands, perhaps 10 percent on either side of the reference point, by coordinated action in exchange markets and through other means (primarily interest rates). The IMF would play a monitoring and facilitating role in such a system, and the G-5's coordinating function would probably be further institutionalized.

U.S. Policy Changes for the Short Term

Reduction of the federal budget deficit. While the misaligned dollar may be the leading proximate cause of the U.S. trade deficit, U.S. fiscal policy may be the chief problem underlying both the high dollar and the trade deficit. Arguably, a dramatic increase in deficit spending was needed to stimulate U.S. recovery from the recession of 1981-82. But a continuation of deficits near or above the $200 billion level has distorted the normal progression of relative growth cycles. The accompanying overvaluation of the dollar has insured that much of this deficit-induced demand is being met by imported goods. And the high dollar is also a product of the federal budget deficit, as foreign capital inflows into U.S. financial markets are boosted by interest rates at high real levels. Substantial reduction—if not the entire elimination—of the budget deficit is needed by 1990 to end its distortive impact on world trade and financial flows.

Improved market access for U.S. goods. Elimination of the budget deficit may be the major domestic step the United States can take to assist in the recovery of a balanced trade position. But the executive branch should use the full panoply of existing U.S. trade laws and negotiating instruments to insure that foreign countries allow fair access to their markets for U.S. goods. The Reagan administration has recently shown greater initiative in using direct bilateral pressure when it feels foreign countries exclude U.S. products or use unfair competitive means to improve their market position in bilateral trade. Some recent examples are the so-called MOSS (Market-Oriented Sector Specific) agreements with Japan on telecommunication products, the semiconductor negotiations and dumping cases against Japan and the administration-initiated Section 301 case against Brazil's national informatics policy. Longer term changes in U.S. trade policy and GATT rules to improve market access are discussed below.

Consideration of a special policy for Japan. Will a general strategy of improving market access and a rising yen bring about sufficient corrections in the U.S.-Japan trade balance? The U.S.-Japan trade relationship is now so lopsided and the overall U.S. deficit so great that one can easily make a case for special bilateral attention and policy actions. The most market-oriented approach would be a policy decision within Japan to reduce the emphasis on export-led growth, now under consideration by the Nakasone government. An alternative would be a "black box" strategy, wherein Japan's surplus would be reduced in keeping with preset targets, using whatever internal policy mechanism Japan wishes to apply. The voluntary automobile export restraints may be considered as a first step toward such an approach. This export quota technique has kept Japanese penetration of the U.S. car market in check—when measured by volume—though the dollar value of the Japanese surplus has continued to grow. European countries and Canada maintain a comparable but more restrictive auto import system with Japan. We should note that any bilaterally negotiated policy should improve access for all industrial exporters to the Japanese market, and not just be intended to produce a cosmetic reduction of the bilateral U.S. deficit.

Creation of an official export strategy. Increased exports represent the most positive and beneficial way in which the United States can reduce its trade deficit. Macroeconomic and exchange rate changes may by themselves reduce the U.S. trade deficit over the next two or three years. But if we are to think seriously about eliminating the trade and current account deficits, we must adopt a coordinated and multidimensional strategy to improve our export performance. The president's trade strategy, announced in September 1985, provides a welcome start with major initiatives in three areas: the exchange rate, improved market access through unilateral application of U.S. trade laws and a $300 million mixed credits "war chest" to combat other industrial countries' soft credit practices in export markets.

One of the most immediately effective elements of an official trade strategy would be a broadening of the war chest proposal to include a resuscitation of our export financing program. In 1972, official export financing supported 25 percent of all U.S. exports, a share that is still equalled or exceeded by all of our major industrial country competitors. In the United States today, however, official export financing only supports 6 percent of total U.S. exports. Two other short-term strategies were also cited in the Young Commission report. One proposal was to narrow the application of U.S. export control laws. The commission calculated that export controls cost the U.S. economy $12 billion in lost exports each year. Another proposal involved enhanced promotion of small business exports. The commission cited GAO figures indicating that wider participation in exporting by small business could increase U.S. exports by $4 billion annually.

Almost certainly such a national export strategy would require establishment of a single Cabinet-level international trade department, as recommended by the Young Commission. The present overlap and confusion of responsibilities between the Office of the U.S. Trade Representative and the Commerce Department, with major roles also played by the Treasury, Defense and State departments, make it almost impossible to effect a consistent and coordinated trade strategy. Each department or agency has to emphasize those solutions to the trade problem that lie within its own specialized area of competence. One recent example is the USTR's analysis of the U.S. trade problem, cited earlier. This report presents a wide-ranging and well-researched analysis of the problem, emphasizing the impact of the exchange rate and macroeconomic policy developments. But its chapter on how U.S. policy can deal with these problems is constrained to discuss mainly bilateral and multilateral trade negotiations, which are at best only a part of the policy solution. This is not surprising, of course, since trade negotiations are the main function of USTR. But it is characteristic of the narrowness of focus of each individual policy organization under the present trade policy structure.

Implementation of selective import controls and trade law reform. As indicated in our first chapter, limited sector-specific trade agreements may be needed to aid a recovery of the U.S. trade balance in basic industries and other industries seriously affected by import penetration, such as machine tools. The present administration has already negotiated quotas for U.S. steel imports and has decided to negotiate a renewal of the Multi-Fibre Agreement in textiles. Many basic and import-competing U.S. industries have been negatively affected, not only by foreign ability to produce a good product at low cost, but by price disadvantages due to exchange rate changes, foreign government subsidies and foreign export targeting practices. Having established a U.S. market advantage, foreign exporters will not automatically surrender that advantage when price conditions are reversed due to a lower dollar. And if the trade deficit worsens further in basic industries, a zero trade deficit will be impossible to achieve. We must caution, however, that selective import controls and out-right protectionism are closely related and, at times, difficult to distinguish. Economic effects may indeed be indistinguishable. This suggests the necessity for policy criteria adopted only after careful study.

Reform of U.S. domestic trade laws to curtail such practices as dumping of goods on the U.S. market and subsidization of exports to the United States, is needed. The recent dumping finding in the Japanese E-PROM semiconductor case, for example, may provide welcome relief to the U.S. semiconductor industry. But it will do nothing to offset the benefits already received by Japanese industry through a practice now found to have been illegal. Important questions of consistency of U.S. trade law and the GATT must be considered. Unilateral U.S. action not consistent with the GATT invites retaliation and a further weakening of the "rule of law" in world markets.

Long-Term Policy Changes

Fundamental changes are required in national priorities to ensure that the United States can achieve and sustain a position of competitiveness in global markets in future years, even if other measures are successful in reducing the trade deficit in the near future. Now is the time to consider and to implement these changes because the trade and balance of payments developments of the past five years indicate more clearly than ever the costs to our country of failing further behind.

Reduce the cost of capital. This is a key issue addressed at some length in the Young Commission report. The commission report estimates that the effective cost of capital is twice as high for manufacturers in the United States as in Japan. Reducing the federal budget deficit would be one way of reducing the effective cost of capital to private borrowers. Another would be tax policy changes that shift the burden of taxation more from capital investment to consumption.

Reform U.S. tax policy. Unfortunately, the tenor of the tax reform proposals produced by the Treasury Department and the version passed by the House in December 1985 move U.S. tax policy in exactly the wrong direction. The overall reduction planned for the corporate tax rate may well prove to be minimal or illusory in application, while it is precisely the key capital goods equipment producers, so critical to reversing the trade deficit, that may be most heavily penalized by proposed changes. Recent NAM testimony on the House tax bill, H.R. 3838, indicated that the proposed reform would raise the overall cost of capital investment in machinery and equipment by 12.2 percent. The capital cost of office and computer equipment would increase by 9.0 percent, and the cost of other types of machinery would increase by 14.0 percent. Even if we add the limited tax deductions for corporate dividends, which would take effect in the "outyears," the overall cost of capital for investment in machinery and equipment would rise by 8.2 percent. Lawrence Meyer of Washington University in St. Louis presented estimates in similar testimony analyzing H.R. 3838, which showed that under conditions of Gramm-Rudman implementation and no Federal Reserve monetary accommodation, tax reform would reduce real business capital investment in equipment by almost 10 percent in 1991. The average rate of change in business equipment investment would fall by 2.1 percent, leading to an average annual 1.2 percent reduction in the net GNP growth and a 1.9 percent average increase in the unemployment rate, according to simulation results he presented.

Thus, the present tax reform proposals encourage the type of high-consumption profile inherent in our present balance of payments deficit and will inhibit, not enhance, U.S. capital goods competitiveness on world markets. The goal of tax reform should be to shift the tax burden from capital investment to consumption. This could be accomplished through some form of value-added tax or other type of consumption tax. One advantage of a VAT is international acceptance that such taxes are rebatable on exports, and this feature is used by most of our major trading partners.

Reform antitrust policy. A totally different problem also addressed in the Young Commission report is the impact of U.S. antitrust policy on international competitiveness. The commission was critical of the general failure of U.S. antitrust enforcement policy to focus on world market shares rather than exclusively on the domestic market when considering whether specific merger proposals would be actionable. In fact, however, Justice Department enforcement policies in recent years have been increasingly cognizant of world market considerations, and the Reagan administration is proposing legislation to codify changes that have occurred in the interpretation and enforcement of U.S. antitrust laws.

Reform U.S. product liability laws. The skyrocketing increase in U.S. product liability insurance costs has had a negative impact on trade competitiveness.

A 1984 Commerce Department study shows that U.S. companies face insurance costs many times higher than those facing manufacturers in Europe and Japan. Some U.S. machine tool and textile machinery manufacturers, for example, must support liability premiums 20 to 100 times greater than those paid by foreign competitors. One capital goods manufacturer has indicated that nearly 5 percent of the sales price of its product is directly attributable to product liability insurance. It estimates that this figure will increase to 10 percent in the next year. International competitiveness needs of U.S. industry are a major factor in creating widespread support for product liability reform among U.S. business organizations.

Reform the GATT. The above long-term policies all refer to changes in U.S. laws and policies that can be enacted if there is a sufficient national consensus behind them. At the present time, the United States is also preparing to enter a new GATT negotiating round, designed to consider major reform in the GATT trade system. GATT is at a crossroads regarding its relevance to the future of world trade. Professor Susan Strange of the London School of Economics recently wrote that the present world trade system had only weathered the recent trade recession not because of GATT, but because countries had negotiated "orderly marketing arrangements" and similar trade deals outside the GATT. Such a view indicates that the GATT must be brought up to date, particularly to encompass more effectively the type of government interventions and nontariff barriers that are now the most pervasive distorting influences on market-oriented trade flows.

The strategy of the U.S. government in this round will accordingly be to broaden GATT trade law in areas that were only partially or unsuccessfully reviewed in the Tokyo Round. This would include improvement in the codes on procurement, subsidies and standards and development of an import safeguards code. In addition, the U.S. government will seek to clarify and expand GATT jurisdiction over intellectual property rights and national policies regarding foreign investment that have a major impact on trade. Trade in services is also an area for enhancement of GATT jurisdiction. Finally, NAM and many members of Congress have called for an international conference on reforming the exchange rate system as a parallel negotiation to the GATT talks.

Improve competitiveness in all areas of U.S. industry. The Young Commission emphasized the need to improve U.S. competitiveness in advanced technology industries. Its recommendations included proposals to enhance government support for applied research and development and to improve engineering education in the United States. These are noteworthy proposals, but we should not overlook the need to improve competitiveness in our traditional capital-intensive industries as well. This point was emphasized by Data Resources Inc. in the "core industries" concept contained in its comprehensive 1983 report on U.S. manufacturing. As these industries modernize to meet world competitive conditions, they have become important customers for high-tech capital goods equipment. The General Motors purchase of EDS in order to establish an in-house, integrated data services arm is but one example of this broad trend. Faced with the conditions of the past five years, our traditional industries have retrenched and taken major steps to improve productivity. A long-term national trade strategy would not ignore such industries in the name of "market forces" or "structural adjustment," but rather seek to make them more effective competitors in an emerging global market that may be characterized by a cheaper dollar and higher foreign growth.

The mixture of long-term and short-term trade competitiveness strategies outlined here involves a major reorientation of some of our domestic political priorities. But with the U.S. trade and balance of payments deficits running at present levels, we are in a very different ball game from ever before. The welcome fall in the value of the dollar, cheaper oil and a marginal improvement in foreign growth prospects hold out the promise of a reduced trade deficit over the next two years. But as noted recently by Treasury Secretary Baker, there is little current prospect for elimination of the overall U.S. balance of payments deficit unless other conditions change. A zero trade deficit by 1990 may be impossible. But unless we have some similar trade deficit reduction goal and a strategy to achieve that goal, we run the risk of fundamental negative economic responses to a perpetual low-growth cycle and balance of payments crises.

Final Comment

It is obvious enough that there are no easy answers. The approach suggested in this report attempts to utilize free market forces, but recognizes that much of world trade now responds to government direction and decision. "Managed free trade" is a contradiction in terms, of course, and offers little by way of principle to guide us other than pragmatism and expediency. "Positive adjustment" and "industrial policy" have their supporters and detractors. This report suggests a trade and balance of payments goal against which to judge policy choices. We oppose drift. Anticipating and attempting to forestall the worst may be a better choice than hoping for the best.

Appendix 1
U.S. Trade Balances—Manufactures and Total Trade, 1970-1985

Year	Manufactures Trade ($ billion) Exports	Manufactures Trade ($ billion) Imports (c.i.f.)	Manufactures Trade ($ billion) Balance	Total Trade ($ billion) Exports	Total Trade ($ billion) Imports (c.i.f.)	Total Trade ($ billion) Balance
1970	29.3	27.0	2.3	42.7	42.8	- 0.1
1975	71.0	55.0	16.0	107.6	103.8	3.8
1976	77.2	69.6	7.6	115.2	129.9	- 14.7
1977	80.2	81.9	- 1.7	121.2	157.6	- 36.4
1978	94.5	106.8	- 12.3	143.7	183.1	- 39.4
1979	116.7	118.8	- 2.1	181.9	222.2	- 40.3
1980	144.0	131.5	12.5	220.6	257.0	- 36.4
1981	154.3	149.0	5.3	233.7	273.4	- 39.7
1982	139.7	150.3	- 10.6	212.2	254.9	- 42.7
1983	132.4	170.6	- 38.2	200.5	269.9	- 69.4
1984	143.1	231.9	- 88.8	217.9	341.2	-123.3
1985	145.4	258.2	-112.8	213.1	361.6	-148.5

Source: NAM, from U.S. Department of Commerce, *International Economic Indicators and Highlights of U.S. Export and Import Trade.*

Appendix 2
U.S. Trade with Major Regional Trading Partners, 1981-1985

	U.S. Exports ($ billion)				**U.S. Imports (c.i.f.)** ($ billion)				**Balance** ($ billion)			
Region or Country	1981	1984	1985	CHANGE 1981-85	1981	1984	1985	CHANGE 1981-85	1981	1984	1985	CHANGE 1981-85
Canada	39.6	46.5	47.3	7.7	46.8	66.9	69.4	22.6	-7.2	-20.4	-22.1	-14.9
European Community	52.4	47.0	45.8	-6.6	43.7	60.3	68.2	24.5	8.7	-13.3	-22.4	-31.1
Japan	21.8	23.6	22.6	0.8	39.9	60.4	72.4	20.5	-18.1	-36.8	-49.8	-31.7
East Asia*	19.6	22.5	20.7	0.8	28.0	46.4	48.6	20.6	-8.4	-23.9	-27.9	-19.5
Mexico	17.8	12.0	13.6	-4.2	14.0	18.3	19.4	5.4	3.8	-6.3	-5.8	-9.6
Other Latin America**	14.9	10.3	10.2	-4.7	12.6	17.4	17.3	4.7	2.3	-7.1	-7.1	-9.4
OPEC	20.7	14.7	12.5	-8.2	51.8	28.1	24.1	-27.7	-31.1	-13.4	-11.6	19.5
Other LDCs	16.0	14.9	14.7	-1.3	16.0	16.7	13.7	-2.3	0.0	-1.8	1.0	1.0
Total Trade	233.7	217.9	213.1	-20.6	273.4	341.2	361.6	88.2	-39.7	-123.3	-148.5	-108.8

*Excluding Indonesia—Counted with OPEC
**Excluding Venezuela and Ecuador—Counted with OPEC

Source: NAM, from statistics in Commerce Department, *Highlights of U.S. Export and Import Trade.*

TESTIMONY OF THE HONORABLE DON RITTER
HEARING ON STRATEGIES FOR EXPLOITING AMERICAN INVENTIVENESS IN THE WORLD MARKETPLACE
SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY
JUNE 26, 1986

MR. CHAIRMAN, THE TIME HAS COME TO MAKE A CONCERTED FEDERAL EFFORT TO ELEVATE AND GIVE FAR GREATER FOCUS, COHERENCE, AND CONTINUITY TO THE ISSUES OF AMERICA'S COMPETITIVENESS. THE ISSUES RAISED BY THE YOUNG COMMISSION, OUR HOUSE REPUBLICAN TASK FORCE ON HIGH TECHNOLOGY INITIATIVES, THE SCIENCE POLICY TASK FORCE OF THE SCIENCE AND TECHNOLOGY COMMITTEE, AND SO MANY OF THE HEARINGS OF THIS SUBCOMMITTEE, LIKE THE ONES THIS WEEK, NEED TO BE BROUGHT OUT INTO THE LIGHT OF DAY. AS THINGS STAND TODAY, WE HAVE NO EXISTING BODY IN WASHINGTON WHICH CAN MOVE FORWARD EFFECTIVELY WITH UNDENIABLE CONSENSUS-BASED IDEAS SUCH AS THOSE EXPRESSED BY YESTERDAY'S PANEL ON QUALITY IN U.S. PRODUCTION. I WAS STRUCK BY OUR INABILITY TO HELP DR. MYRON TRIBUS AND THE NSPE ACHIEVE THEIR NOBLE, INARGUABLE GOALS OF MAKING AMERICA THE HIGHEST QUALITY, LOWEST COST PRODUCERS. DR. TRIBUS ADVISED US TO ASK QUESTIONS IN THE COURSE OF OUR ACTIVITIES AND INVESTIGATIONS. THAT'S ALL WELL AND GOOD, BUT CONSIDERING WHAT'S AT STAKE, CONSIDERING A YAWNING GAP IN THE NATIONAL CAPABILITY AND QUALITY OF INDUSTRIAL PRODUCTION, CONSIDERING THE ACCELERATING EXPORT OF INDUSTRIAL JOBS AS U.S. MANUFACTURERS GO OFFSHORE, WE NEED TO DO MORE.

THIS LACK OF A "HOME" FOR INDUSTRIAL COMPETITIVENESS ISSUES IN WASHINGTON WAS RECOGNIZED BY THE PRESIDENT'S COMMISSION ON

INDUSTRIAL COMPETITIVENESS, THE YOUNG COMMISSION, WHEN THEY SOUGHT TO CREATE A NEW FEDERAL DEPARTMENT OF SCIENCE AND TECHNOLOGY. THE ALSO KNEW OF THE DIFFICULTIES INVOLVED IN SUCH A MAJOR "REORGANIZATION." WHILE I DON'T BELIEVE THAT THE IMPETUS IS THERE FOR SUCH CONSIDERABLE REARRANGEMENT AND I DON'T BELIEVE OUR RECORD OF SUCCESS IN "REORGANIZATIONS" IN WASHINGTON IS SO ENCOURAGING AS TO PROCEDE WITH SUCH A BIG-ONE, THERE'S A LOT THAT CAN BE DONE BETEEN CREATING A NEW CABINET LEVEL DEPARTMENT AND THE VIRTUAL ZERO LEVEL OF A COORDINATED APPROACH TO SCIENCE, TECHNOLOGY AND INDUSTRIAL RESEARCH WE HAVE NOW.

THE HARD FACT REMAINS. NATIONAL/GLOBAL ISSUES MUST HAVE SOME NATIONAL/GLOBAL RESPONSE FROM THE U.S. OUR SINGLE ENTERPRISES NEED HELP FROM OUR NATIONAL GOVERNMENT WHEN DEALING WITH THE CHALLENGES AND OPPORTUNITIES PRESENTED BY FOREIGN PRODUCERS WHO ARE EITHER GOVERNMENT-BASED OR GOVERNMENT BACKED. THAT'S A FACT OF LIFE IN THE GLOBAL MARKETPLACE WHICH CANNOT BE DENIED AND NEEDS SOME RESPONSE. THOSE POLITICAL RESPONSES DERIVED MAINLY FROM FRUSTRATION COULD BE SELF-DEFEATING IN THE LONG RUN. NEW FORMS OF PARTNERSHIPS -- WITH THE FEDERAL GOVERNMENT SEEKING TO BOOST OUR SIDE'S ABILITY TO COMPETE, PROVIDE LEVEL PLAYING FIELDS AND OPEN DOORS FOR US -- ARE ESSENTIAL.

TO FURTHER THIS "NEW PARTNERSHIP," WHEREBY FEDERALLY DEVELOPED TEHCNOLOGY IS BETTER TRANSFERED TO THE PRIVATE SECTOR AND THE

WHOLE GAMUT OF ISSUES OF INNOVATION, COMMERCIALIZATION AND COMPETITIVENESS CAN BE EXPANDED, I AM PERSONALLY DRAFTING A BILL TO ESTABLISH THE NATIONAL BUREAU OF STANDARDS AND INDUSTRIAL COMPETITIVENESS (NBSIC) OUT OF THE EXISTING NBS AS THE FEDERAL GOVERNMENT'S PRIMARY INSTITUTIONAL FOCUS ON INDUSTRIAL COMPETITIVENESS ISSUES. I ENVISION AN NBSIC ENTITY WHICH GIVES A CIVILIAN HOME TO THE PRESENTLY HOMELESS. MITCH SNYDER, THE ACTIVIST, HAS BEEN VOTED A CENTER. NOW ITS TIME TO HAVE A REAL HOME AND AN EMPETUS TO NEWLY EMERGING FEDERAL EFFORTS IN THE MANUFACTURING SCIENCES AND TECHNOLOGIES, AND OTHER INDUSTRIAL COMPETITIVENESS PROJECTS WHICH FOR SO MANY YEARS HAVE LAUGUISHED AND ONLY TODAY ARE EMERGING BUT AS FOSTER CHILDREN IN FOSTER HOMES. THE NBSIC WILL SEEK TO BRING TOGETHER UNDER ONE ROOF, SO TO SPEAK, A SIGNIFICANT PORTION OF THE PRESENTLY DISPERSED AND CONSEQUENTLY WEAK EFFORTS IN THIS FIELD: APPROPRIATE ONGOING EFFORTS IN SCIENCE, TECHNOLOGY AND POLICY STUDIES.

IN CREATING NBSIC, WE SEEK TO STRUCTURE AN ORGANIZATION THAT, WHILE FEDERAL IN ORIGIN, IS ESSENTIALLY MOTIVATED, DRIVEN AND EVENTUALLY FUNDED BY THE PRIVATE SECTOR PLAYERS WHO ULTIMATELY MUST RESPOND TO THE COMPETITIVE CHALLENGE.

WHY "IC" COMBINED WITH "NBS?" THE NATIONAL BUREAU OF STANDARDS IS THE NATURAL HOME OF SUCH EFFORTS. THEIR RECORD OF WORKING WITH AMERICAN INDUSTRY ON CUTTING EDGE APPLICATIONS OF SCIENCE AND TECHNOLOGY IS EXCELLENT. THEIR ORIENTATION TO

PROBLEMS FACED BY THE PRIVATE SECTOR IS GREATER THAN ANY OTHER FEDERAL AGENCY. THEIR INTERDISCIPLINARY CAPABILITIES, THEIR SUPERB FACILITIES, THEIR EXCELLENT STAFF, ALL SERVE WELL AS A STARTING BASE FOR NBSIC. INDEED SUCH AN INFUSION OF NEW CHALLENGE CAN SERVE TO INVIGORATE A FLAGSHIP OPERATION WHICH HAS BEEN BUFFFETED BY BUDGET EXIGENCIES IN RECENT YEARS.

MR. CHAIRMAN, THERE ARE MANY EXCELLENT FEATURES OF YOUR BILL, H.R. 3997 WHICH COULD BE INCORPORATED INTO THE FUNCTIONS OF AN NBSIC ALTHOUGH I WOULD HASTEN TO ADD THAT NBSIC WOULD TAKE A MORE MODEST, MORE NUTS AND BOLTS APPROACH TO THE COMPETITIVENESS CHALLENGE. NEVERTHELESS, H.R. 3997 DOES YOEMAN SEVICE TO THIS EMERGING DEBATE AND THE ISSUE DOCUMENTS SUPPORTING IT SHOULD BE REQUIRED READING FOR ALL MEMBERS OF CONGRESS.

MR. CHAIRMAN, I WISH TO PERSONALLY THANK YOU FOR YOUR PIONEERING EFFORTS AND YOUR CREATIVE VISION WHICH BRINGS SO MUCH TO THIS CRUCIAL DEBATE. I LOOK FORWARD TO WORKING CLOSELY WITH YOU AND THIS COMMITTEE IN THE UPCOMING WEEKS AS WE FINALIZE OUR PROPOSALS FOR CREATING NBSCI.

THANK YOU.